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1941 Vol. XLIX

MARCH 7th, 1946

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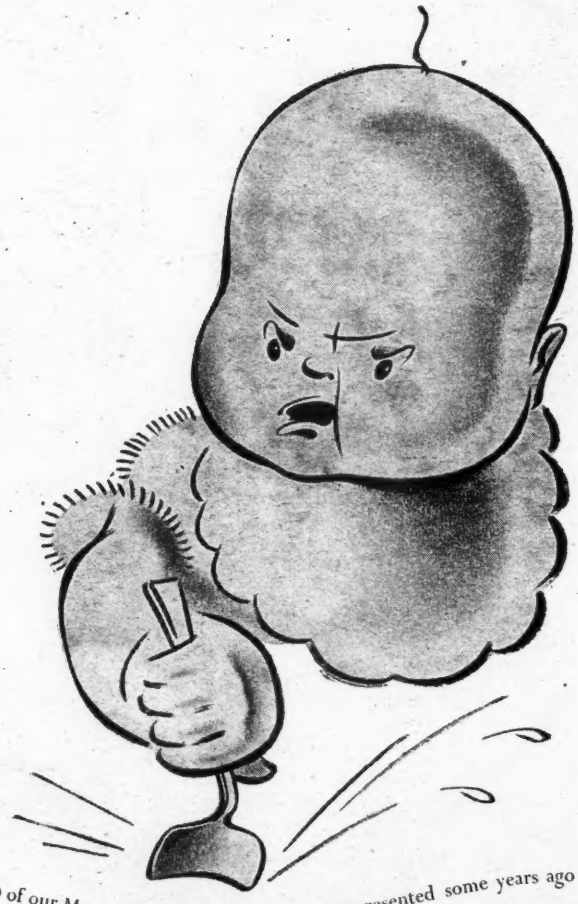

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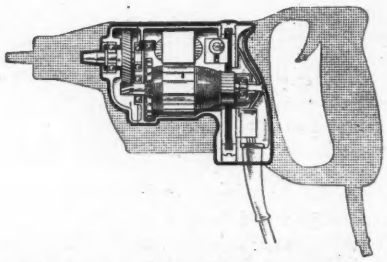

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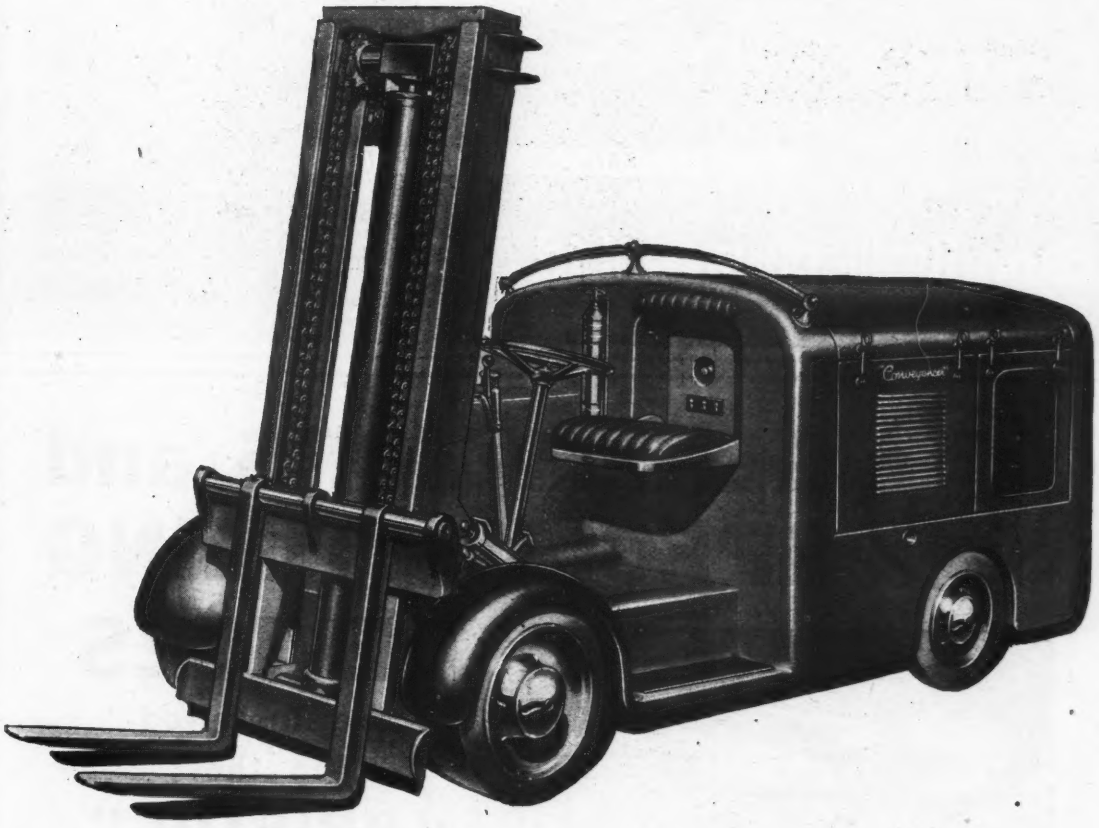

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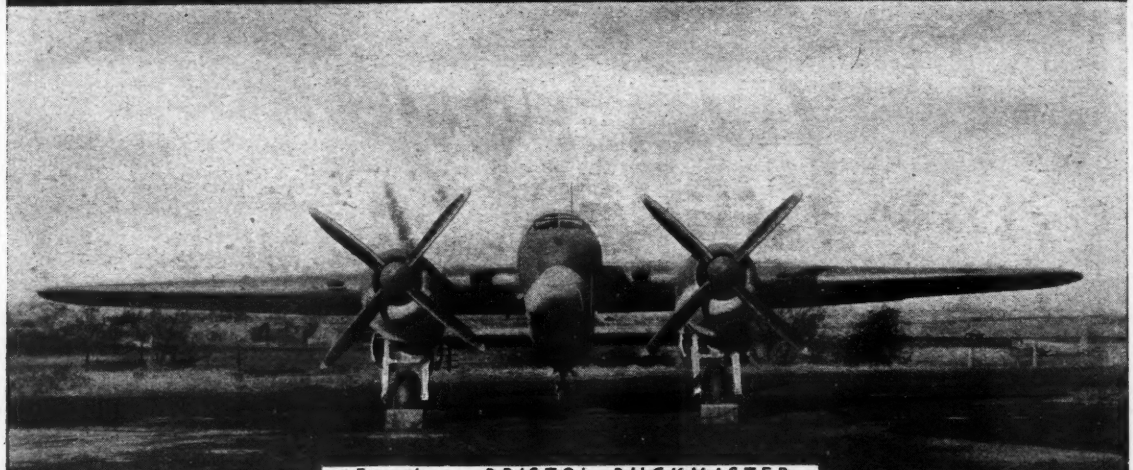

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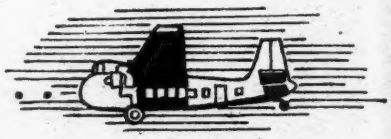

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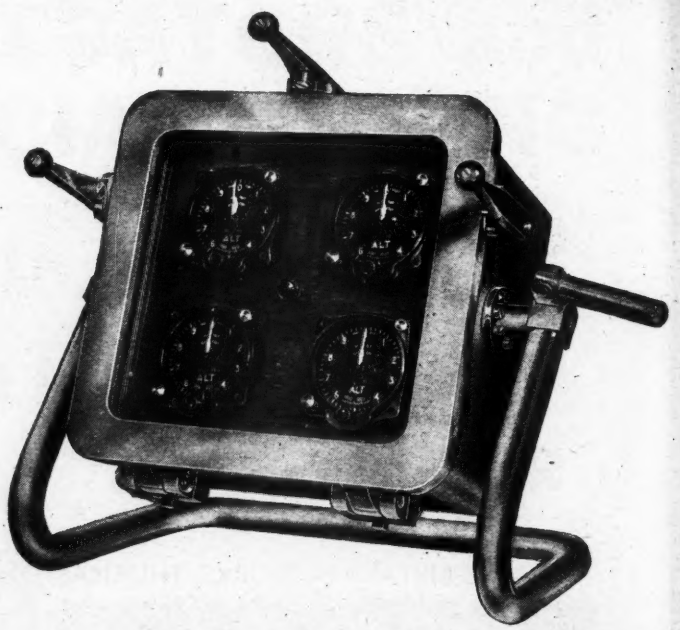

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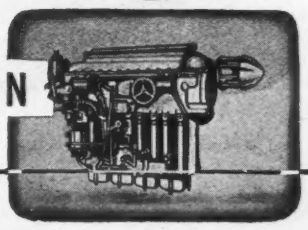

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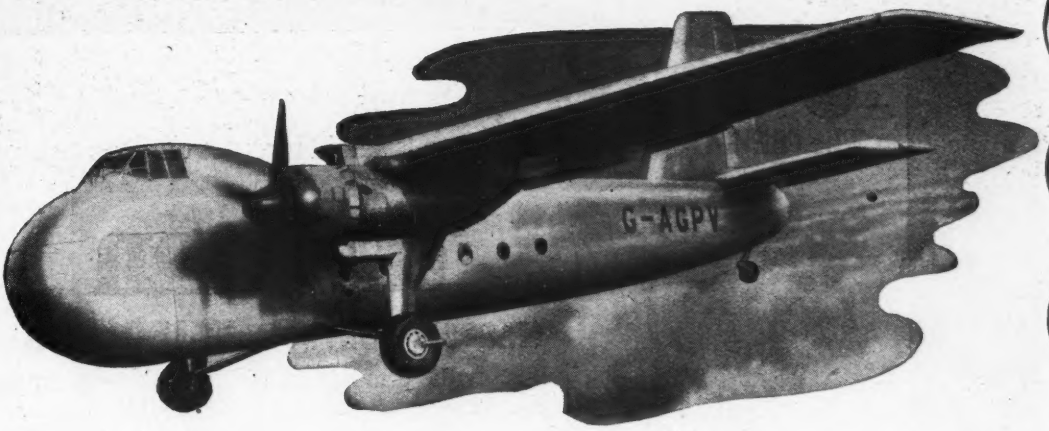

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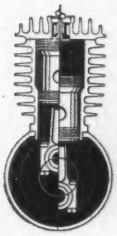

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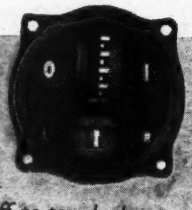

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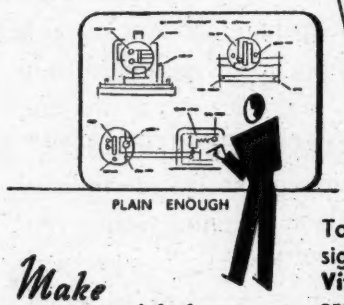

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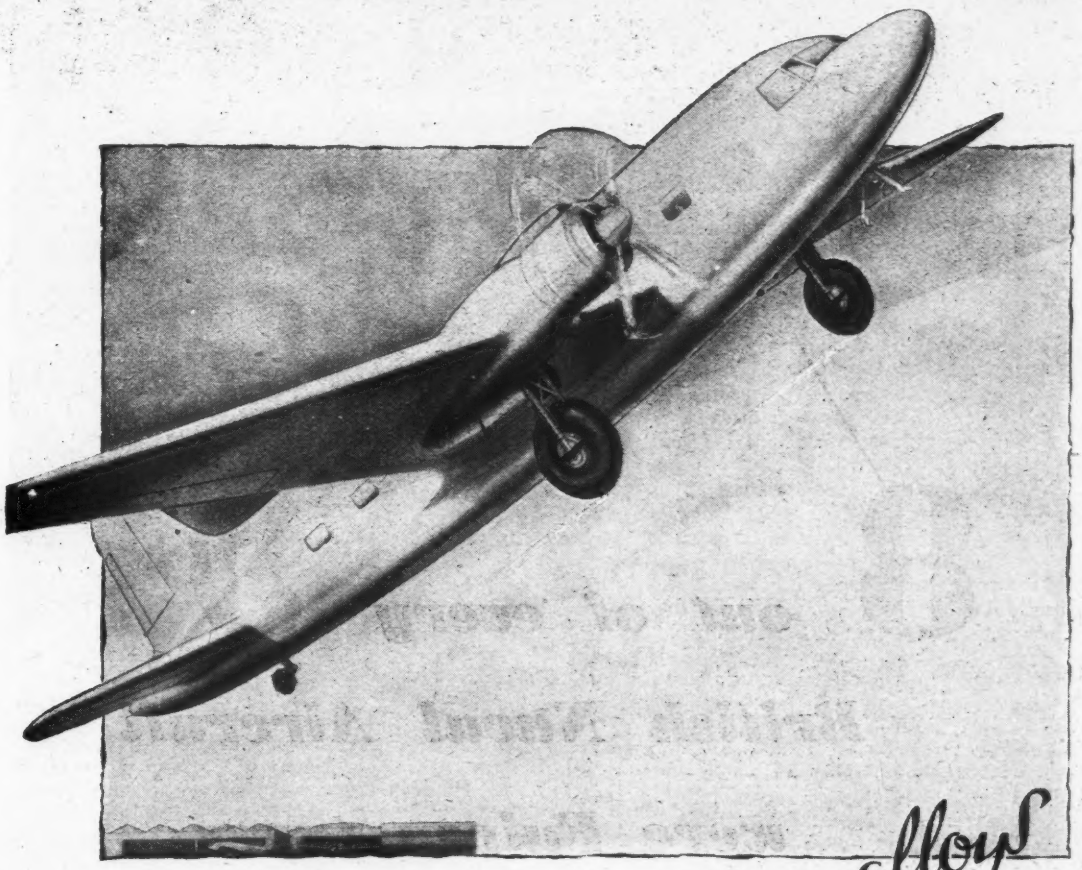

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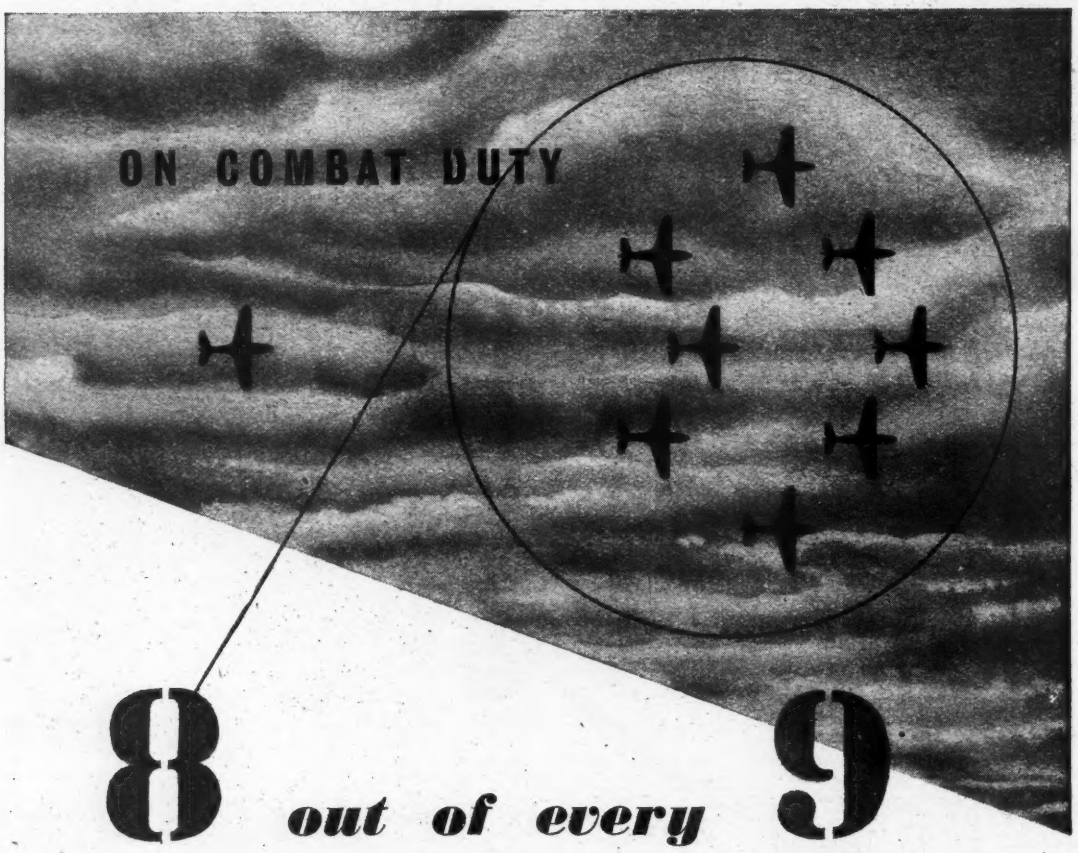

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The Outlook

False Alarms

ALTHOUGH not very important in itself, since he was never actually missing, the "disappearance" last week of Air Vice-Marshal Bennett, of which such a tremendous fuss was made in the daily papers, has drawn attention to a matter which, if and when private flying really gets going again, is likely to have a very considerable bearing on the future use of private aircraft. Something seems to have gone wrong, in this particular instance, but Bennett himself is reported by *The Times* to have said: "My secretary, or the man in charge of the hangar at Heston where I kept my aircraft, could have told anyone where I was." That, of course, would have been the obvious solution, but apparently it did not occur to the official mind.

When Charles Lindbergh lived in this country he more than once flew away without disclosing his destination, and in so doing caused a lot of trouble to people concerned with knowing the whereabouts of all aircraft. There were those who, last week, dismissed the "disappearance" of Air Vice-Marshal Bennett as a mere dodge to obtain publicity. That we do not believe for a moment. Bennett is not in need of that sort of publicity nor, we are sure, would he seek it.

The incident is regrettable, but it will have served some useful purpose if the whole question of private aircraft movement reporting can be reconsidered. There are two distinct and quite opposite courses of action which might be adopted. At one extreme, pilots of private aircraft might be permitted to fly to and from any point in the United Kingdom without any reporting formalities; or at the other extreme, they might be called upon to follow, in detail, the procedure established during the war.

There is something to be said on both sides. The private pilot may be regarded as the air equivalent of the yachtsman who sails from port to port in the British Isles without a lot of formalities. If he wishes to be reported during a passage, he may be so reported by a coastguard station if he is in a position to make the identity of his yacht known.

On the other hand, it may be argued that the main reason for all this reporting is that a machine might fail to reach its destination, or might have made a forced landing somewhere. In the latter case the occupants might be injured and badly in need of help. Without a reporting system, days might pass before it was even realised that the machine was missing. Frankly, in actual practice, we rather doubt the value of that argument. It would appear that in most cases of forced landings with serious results, a crashed aircraft has been found by local farmers rather than as a result of any air search instituted after the aircraft had been reported missing. If that be so, the case for making optional use only of the standard procedure would seem to be a strong one.

Bilateral Agreement

THE satisfactory conclusion of an up-to-date civil aviation agreement between Great Britain and France last week represents, as Mr. Ivor Thomas said, another significant step in the orderly development of world civil air transport.

As there is now a more-or-less standard form for these agreements, many of the articles of the Anglo-French agreement are virtually identical with those approved between U.S. and ourselves at the Bermuda conference. However, there are two important features of the new agreement both of which appear to be aimed at eliminating finally all risk of unregulated competition between the airlines of the two countries.

The first is the appointment of a standing joint committee composed of representatives of the two countries, in order to regulate fares, service frequency and similar matters. The second is a corollary to this—an agreement that traffic between the two countries shall be

equally shared between the British and French operating companies. The actual schedules of the air services in which the two countries are interested appear to have been carefully thought-out in conjunction with the application of "fifth freedom" principles.

At least no one can say that the Ministry has stood still over such matters as these agreements. During the past few weeks, agreement has been reached with the Americans and with the French over control of mutual air services, a delegation has visited Scandinavia with the same object in view, and at this very moment both the Minister of Civil Aviation and the chairman of B.O.A.C. are visiting Australia and New Zealand in order to establish Britain's interest in the South Pacific routes.

The Atlantic Gap

THE news that the B.O.A.C. transatlantic flying boat service from Poole to Bermuda via West Africa and South America makes its last run today will be by no means unexpected. The discontinuance of this service was bound to come soon, for, although the three Boeings, which have been in constant use since 1941, have given excellent service, they could not be expected to go on for ever.

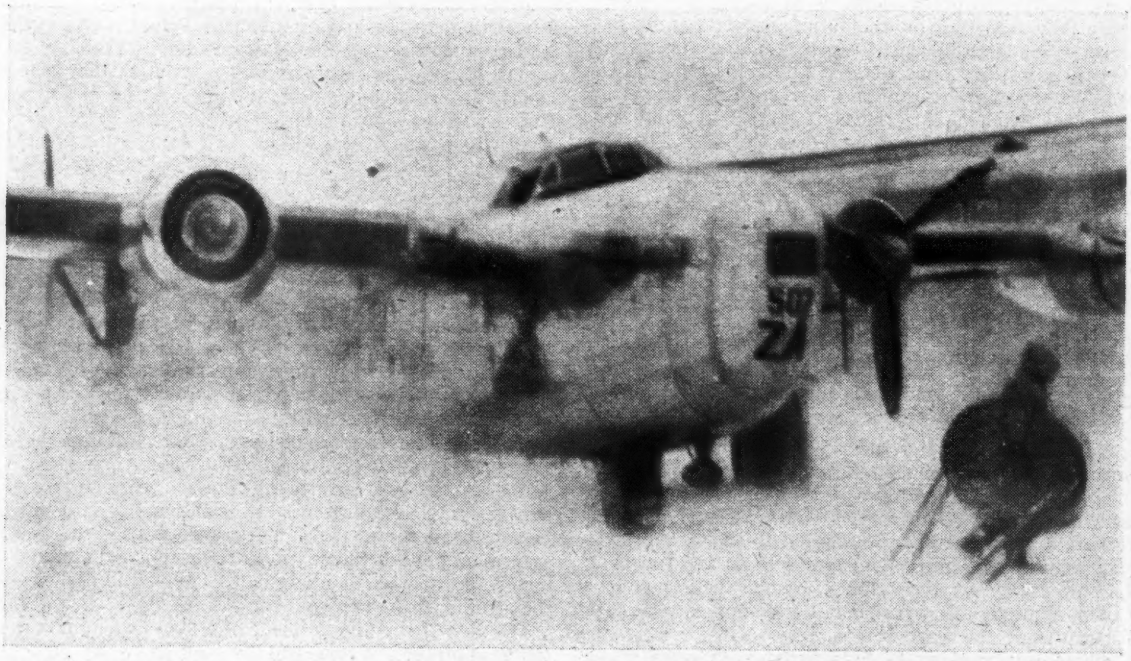
In a sense, the service has always been something of a stop-gap, but, in spite of this, one weekly transatlantic flight has been made in each direction during the winter months, and four flights in each direction throughout the summer each year. The wear and tear on these three machines must have been considerable, and praise is due to B.O.A.C. for having maintained such a schedule with these slender resources.

It is expected that the five Constellations which have been ordered from Lockheeds will not be delivered and tried in time for their regular use on the route to start much before July. Deliveries may begin in May, but crews have to be trained (this is being done in America) and the machines thoroughly tried-out before actual operations can begin, and all this is likely to take time.

Great dissatisfaction has been expressed in many quarters with the decision to buy these Constellations. When the announcement was first made of the intention to buy these machines, we expressed the view that no permanent harm to British aviation was likely to be caused thereby. But at that time it was thought that the Constellations would prevent a gap occurring in the British transatlantic service. Now that it has become evident that there will be a gap of some four months' duration, the picture has changed very considerably. It may be a couple of months later in the year before the Tudor Is are ready to operate the service, but if gap there is to be, it does not appear very important whether it is of four or six months.

CONTENTS

The Outlook	229
Let Us Be Honest	231
Here and There	233
Freighter and Wayfarer	235
R.N.Z.A.F.'s Second V.C.	240
London's Greatest Airport	a
Canadian Fox Moth	241
Stress Without Strain	243
Anglo-French Agreement	246
Civil Aviation News	247
Radio and Civil Aviation	249
Correspondence	251
Service Aviation	251
The Industry	254



SEASONABLE SERVICING: Maintenance must go on, as this wintry scene at Dorval, Montreal's airport shows. A ground engineer with an engine snow protector tries to avoid the whirl of snow as an engine of one of B.O.A.C's return ferry service Liberators is run up.

"Indicator" Discusses Topics of the Day

Let Us be Honest

The Continued Need for Uncompromising Realism : Too Much Publicity-consciousness : Prototype Development No Easy Matter : Hard Work Ahead

HOWEVER difficult our civil aviation position may sometimes appear to be, I hope we shall continue to walk quietly and carefully along the narrow path between two quicksands from which there can be no possible rescue. One of these is a tendency to exaggerate our achievements or to "cook" the performance figures of our aircraft types; the other is a leaning towards defeatism and to a belief that everything the Americans do, and every aircraft they make, must necessarily be perfect.

There is undoubtedly in this country a distinctly growing weakness for the transatlantic habit of ballyhoo. It has been appearing slowly in the commercial world and is probably the result of the international nature of publicity as such. We are becoming, in fact, too publicity-conscious, and are tending more and more to the idea that the public can be indefinitely fooled and even, perhaps, that mild dishonesty may, after all, be the best policy. It is not and never has been.

Fortunately, the virus has not yet taken hold and, at least where aircraft are concerned, our more technical friends in America still consider us so honest that they tend to add about thirty per cent to our published aircraft performance figures—in their own minds, if not in the public prints. That is presumably because the American technicians have been publicity-conscious for so long that, like the friends of the little boy who cried "Wolf," they no longer believe the figures put out by their competitors and, in order to obtain an honest comparison, they must make the necessary allowances.

It is, after all, so easy to be, so to speak, dishonestly honest about aircraft performances. A manufacturer can publish a whole heap of figures, each one of which may be the best, and quite true in itself, but having no relation to the others. To quote an extreme case, a maximum-range figure for a minimum payload can be given alongside a maximum-load figure, and even climb rates and level-speed figures can be "cooked" by the simple expedient of giving each for a series of tests made with specially adjusted airscrews.

Fictitious Values

Our own people tend, perhaps, to be too afraid of any possible "adverse publicity" and of the horrid things which *might* be written about their products—to be repeated abroad in due course. Naturally, there are certain somewhat irresponsible writers depending only on immediate news value—a "value" that is largely fictitious—but most of them are, in fact, trying hard to get at the truth and usually need only to be given the facts. A manufacturer might, perhaps, if he told the whole truth, get a headline like "Designer Muffs New Aircraft Drawing: Marked Fore-and-Aft Instability on First Flight Trials"—but it doesn't really seem to be very likely, does it? What is so much more possible is that, if any preliminary faults are kept very dark, the journalists will suspect a trap and merely try to make their stories short and non-committal.

The American aircraft industry should by now have found that the public cannot really be fooled, and that all but an unimportant section of the community is unimpressed by the continuous present-day cry of "Wolf." The majority of the members of this community now know that quite strong winds sometimes blow from West to East, and it is especially tragic when a reputable British journal records, in all seriousness and without covering explanation, the words of the pilot of the Lockheed coast-to-coast Shooting Star when he is alleged to have remarked that he "sometimes flew at 660 m.p.h. but was never full out." Even the less-informed members of the American and British public, on reading this, must naturally ask why, then, the world's speed record hasn't been re-broken by the U.S.

The statement made may, of course, have been perfectly true of the ground speeds recorded; but it would have been far more to the point if some unusually intelligent publicity tycoon had taken the trouble to think of a way in which the only really important part of the story—the fact that a jet-propelled fighter had stayed in the air for more than four hours—could somehow have been put across. The trouble with most public relations experts is that they are only able to stress the obvious and seem to be forced to follow the usual lines. Maybe it isn't their fault—very often they are being bullied by publicity-conscious directors or presidents.

Credit Stealing

It would be amusing to recapitulate some of the extraordinary stories one hears—even to the standard of that in which a most ambitious tycoon is reported to have considered the idea of suggesting to the public, little by little, that the Spitfire was really an American aircraft. But it wouldn't get us anywhere. The point is that we must see that we do not fall into the same trap.

At the moment, undoubtedly, the great British public has somehow been made to believe that, so far as civil aircraft are concerned, the Americans have got everything that opens and shuts. Certainly they have got one or two prospectively good aircraft in the offing and one or two good ones already in the air. But the development of any new type is far from being an easy business, and, if we have our troubles, you can be sure that these are at least partly paralleled on the other side of the Atlantic.

There is, for instance, one otherwise excellent American transport which cannot, one hears, be run continuously on weak mixture because the engines develop valve trouble, but, on our side of the water, too, there have been engine failures. The work of developing satisfactory cabin conditioning and suitable thermal or other de-icing equipment has been slow, and experiments have had their set-backs both here and there. And only the test pilots and development engineers would be able to tell the truth about the control compromises which may have been necessary.

Maybe some of the difficulties of international appreciation would disappear if our old friend the test pilot had remained as recklessly and interestingly talkative as he used to be in the old days. Unfortunately, perhaps because the business of professional test flying has become so much like any other job of work in the industry, even he has become, so to speak, encased in the publicity veneer, and retains a poker-face attitude unless he is talking to another test pilot or to a very close friend.

It would seem that all first tests are automatically "satisfactory" nowadays. Even if, on the day after this first test, the prototype is to be seen in the experimental shop with all its control surfaces missing, or if, a few weeks later, the outfit appears with a vast dorsal fin stretching from rudder to nose, or with half a dozen extra rudders, the pose is still maintained. One day the reflex habit of denying any difficulties will become so strong that the words of the official Press release after a particular first test may be: "Very satisfactory indeed. There will,

LET US BE HONEST

however, be a slight delay before further tests since the aircraft was unfortunately written off."

In fact, of course, even the near-perfect prototype is a very rare bird indeed—as rare as the "dazzling, stupendous and colossal" new aircraft which so often prematurely appears after a few months of development work. Only about half a dozen wartime aircraft, British or American, eventually became *really* good, and fewer than that must have been obviously good from the very start. It is difficult, then, to see why the proportion among civil aircraft should be any higher. Designers are still groping along in the half-light, and just now the problems are admitted to be greater in possibilities of error than they have ever been.

The chances of complete initial success are, perhaps, about fifty-fifty. That is why it is probably still better for civil aircraft orders to be spread quite evenly around the industry, and why it is, so far, better to have a number of medium-sized aircraft in course of development than to stake everything on one or two stupendous affairs. Development, in any case, takes a very considerable time, and some firms will always be luckier than others.

Of all the beautiful new transports which are being promised on the other side of the Atlantic, I wonder how many will be good straight off, and how many, even, will be capable of being made very good? And I wonder how long it will be before any of them are in service? The design work on the Constellation started in 1939 and the aircraft is only just going into service. Admittedly, a war intervened and the design was well in advance of its contemporaries—but six years is a long time.

All kinds of dazzling prospects are reported from the other side. There is the big Constitution; the Consolidated-Vultee 37 (with, one is told, six 5,000 h.p. engines); the new Strato-cruiser (135,000 lb. all-up weight); and the Rainbow (with a promised 400 m.p.h.). Aircraft like these, with new power units and new control systems, or even, like the DC-8 (or Mixmaster), with an entirely different and unconventional layout, cannot be developed quickly.

Let us worry, by all means, and work very hard indeed to ensure that our future transports are as good as, or better than, anything else. But let us not be reduced unnecessarily to tears by mere hopeful conjecture. The production of the new and better series of civil aircraft is going to be a very tough job indeed—and on both sides of the Atlantic.

Departure of U.S. Army 8th Air Force

Last Lend/Lease Airfield Handed Back to R.A.F.

ON February 26th, at Honington airfield in Suffolk, the U.S. Army 8th Air Force handed back to the Royal Air Force the last of the 112 airfields which they had occupied for operations in Europe. Brigadier General E. C. Keil, the last commander of the Eighth in England, handed over to Air Marshal Sir James Robb, A.O.C.in-C. Fighter Command.

As the American flag was hauled down an R.A.F. band played the Star Spangled Banner, and contingents of the two nations' air forces stood to attention.

Before he left General Keil said: "The Eighth will be gone from England, but I can assure you that England will never be gone from the minds of those who served with the Force. Hospitality extended by a people at a time when they were fighting for existence can never be forgotten. I have yet to hear of a single American operational mission which suffered for lack of co-operation. This same team work will, I am sure, exist between our two great nations in the solution of problems for a peaceful world."

Brigadier General Keil was the commander of the Eighth Fighter Command, the last unit of the Eighth Air Force to leave the United Kingdom.

In their early efforts the Americans were experimenting with daylight bombing—"an untried theory of air warfare," as one of them put it. The first American raid was made on Rouen on August 17th, 1942, and there were only 12 Fortresses available to take part in it. In the early raids too many bombs fell outside the target area, and that meant damage to France. Technical modifications were made in the machines as experience was accumulated. After a while the authorities decided that an armament of 13 machine-guns, mainly of 0.5in calibre, was not enough protection. Escort fighters were needed, and in time the long-range Mustang and Thunderbolt were evolved.

R.A.F. Bomber Command was a night-bombing force; the Eighth Air Force indulged only in day-bombing. The two fitted in together. It was not only that the combination made possible all-round-the-clock attacks on Germany; there was more in it than that. For a long time in the middle of the war Bomber Command went in for area bombing. The object was to counter the German plan of distributing work on components in numerous small factories, bicycle shops and the like, throughout a city. In such cases there was usually one key factory or assembly shop some little distance outside the city. Night bombing could not make sure of dealing with that building. But the Americans, working by daylight and using their remarkably accurate bomb sight, were able to follow up the raid of Bomber Command and obliterate this key building. At the end, however, when the Americans were at full strength, the roles of the two were largely reversed, and Bomber Command (thanks to its Pathfinder technique) achieved a high degree of accuracy in hitting special small targets.

Common Effort

It was not only in operations that the R.A.F. and the U.S. Army Air Forces worked together. The R.A.F. from the start laid itself out to ease the problems of the Americans who were building up a huge Air Force with Britain as an advanced base, and the breadth of the Atlantic lying between it and the home factories. A chronicler of the American effort has written that from the start the attitude of the R.A.F. to their Allies was "Tell us what you want; if we have it it is yours." And, says the writer, they might have added, "Whether or not we need it ourselves." On the other hand, the R.A.F. always found the Americans ready to give any help they could. A strong bond of brotherhood of the air was built up between the two sets of airmen, many (but by no means the majority) of whom had common ancestors.

The Americans came early in 1942. Last year their strength was 7,177 bombers and 6,203 fighters. The bombers flew 754,818 sorties and dropped 1,461,864 tons of bombs. There were 41,186 casualties in the Eighth Air Force, and 6,319 aircraft were lost.

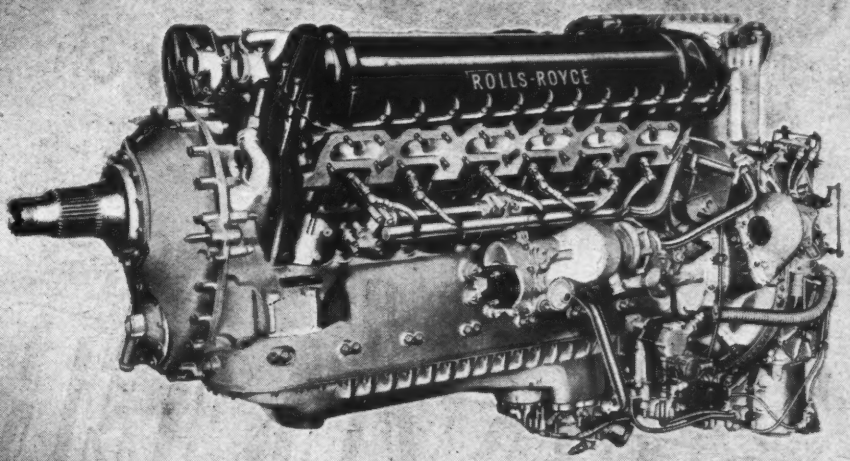
And now the Americans have gone. Their going means that the tragedies of war are over—and that nobody can regret. We know too that they are only too anxious to get home to "God's own country," and we must be glad that these gallant men are getting their heart's desire. In some ways, too, it will be convenient for Britons to have their own country again, and to start reconverting the American airfields into farms. So it would be hypocrisy to say that we are altogether sorry to see them depart, though many good friendships are being severed. But we must emphatically say that we are infinitely glad that they came.

MAKING HISTORY IN THE AIR-AGE

South Africa

WITH ROLLS-ROYCE AERO ENGINES

The famous 'round-the-world' and 'North Pole' Lancastrian "Aries," fitted with Rolls-Royce "Merlin" power plants, has set up a new record for a flight to the Cape—nearly 7,000 miles—in 32 hours 21 minutes; beating the previous record by over seven hours.



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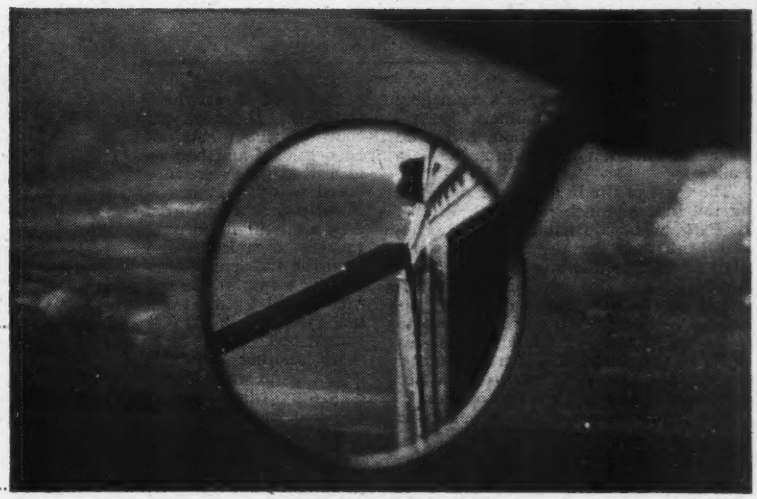
HERE AND THERE



TWO HORIZONS: An excellent rear view is obtained in the "driving mirror" of the Sikorsky helicopter—very useful when reversing! Laleham reservoir can be glimpsed in the reflected landscape.

Disbanded

THE R.C.A.F. Mail Squadron, which has carried more than 3,000,000 lb. of Service mail between Canada and Europe and has over 600 transatlantic crossings to its credit has now been disbanded. This was reported by the Canadian Broadcasting Corporation last week.

Trans-Canada Airlines' overseas service is carrying on the work previously done by this squadron.

Bandoeng Express

A *REUTER* report from Batavia last week says that R.A.F. Transport Command Dakotas operating on what is known as the "Bandoeng Express" run broke their tonnage record for the third time in six days.

They flew 188 tons of supplies from Batavia to Bandoeng hill station, south-east of Batavia, and returned with 72 women and children and a number of casualties.

The previous record load for this particular supply route was 172 tons.

Homeward Bound

S.S. *Manela*, the R.A.F.'s mobile flying-boat base which has been operating under the direction of the Indian Ocean Air Force, has said farewell to S.E.A.C. and is on her way home to England from Singapore. She is carrying 500 officers and men, the majority of whom are tour-expired repatriates from the R.A.F. in the Far East.

Built at Clydebank in 1921, the *Manela* has, since 1939, served with the R.A.F. at Scapa Flow, the Shetland Isles, Iceland, and West Africa, and was used as a supply ship between the R.A.F. island bases at Mauritius, Diego Suarez, and the Seychelles.

Air Marshal Sir Arthur Coningham signs the visitors' book at the R.A.F. Exhibition in Zurich.

Under the control of No. 222 Group, S.E.A.C.'s "Coastal Command," Sunderland flying boats used her as a base for attacks on Jap vessels off Malaya and in the Gulf of Siam.

As many as 13 Sunderlands operated from her at the same time and she has also serviced Air/Sea Rescue Catalinas.

REVIVALIST: This twin-boom pusher, known before the war as the Stearman-Hammond, is Henry Kaiser's latest aviation interest and has been tentatively renamed the Kaiser-Hammond. It is now undergoing tests at Oakland, California.

Swish!!

IN describing a selection of dresses for sale, an advertisement in a recent issue of *The Lady* reads, "— one jet, with silk lining, £2 10s."

Obviously the very thing for "The Young Lady of Gloster!"

Aerial Queue

MASCOT Airport, New South Wales, Australia, is reported to be suffering from serious congestion and airline pilots have complained that they often have to go round again because inexperienced private pilots and club trainees get in their way. One airline pilot described landing there as a nightmare, the airport being much too small for present-day traffic.

Research by Robots

IN order to try to find out the strength and extent of the blast from an atom bomb, the strength of its radio-active effect, and if there is radio-activity in the huge mushroom that forms above the explosion, ten radio-controlled, crewless Flying Fortresses are to take part in the first atom bomb test arranged by the U.S. authorities for May 15th in the Pacific.

The test is a combined operation by the U.S. Army, Navy and Air Forces, and the Flying Forts will be flown above the target area, presumably at various altitudes and distances from the explosion.

They will, says the report, take off, transmit data, and land (assuming they survive) entirely by radio control.

R.Ae.S. Celebrations at Luton

ABOUT 100 persons sat down to dinner when the Luton branch of the Royal Aeronautical Society gathered at the George Hotel to celebrate the 80th anniversary of the parent society, and the guests included Sir Frederick Handley Page, its president, Major G. P. Bulman, a member of the council, Capt. J. Lawrence Pritchard, its secretary, Capt. P. D. Acland, a former branch president,

HERE AND THERE

Mr. H. G. Nelson, Napier's managing director, Mr. W. A. Summers, general manager of Hunting Aviation, Ltd., and Inspector Thomson of the Luton Borough Police.

The toast of the R.Ae.S. was proposed by the Luton branch president, Mr. W. E. Park, who paid tribute to the excellent work done by the Society in preparing and disseminating technical information, and he also mentioned the excellent apprenticeship scheme offered by the S.B.A.C. Sir Frederick was well up to his usual humorous standard in his reply, in the course of which he stressed the value of discussion groups for a free interchange of experience and opinion.

The Luton branch of the R.Ae.S. was formed in 1942.

Tiresome

AT least one of the official reports on the Combined Intelligence Objectives Sub-Committee, whose members were formed into teams to examine German industrial activities in liberated Europe, indicates among more important technical matters, that the examining team often had a decidedly trying time of it.

As an example this team of two British and two American officers who went in August, 1944, to examine aircraft engine factories in the Paris area left Northolt at 10.15 a.m. and did not reach their Paris billets until 9.50 p.m. Next morning they attended a meeting with other teams (including special personnel sent direct from the U.S.) about 70 per cent. of whom had not been briefed and had no idea what they were supposed to do. It consequently took them from 8.45 a.m. till 12.30 p.m. to get organised, and then the transport promised for 1.15 p.m. did not arrive until 3 p.m., when one jeep with trailer turned up!

On another day this engine team waited from 8.45 a.m. till 2.15 p.m. for their transport.

No wonder that the squadron leader in charge referred in his report to the "complete lack of organisation" and the consequent "great deal of unnecessary labour involved."

BUG BOMBER: Turning from Jap busting to crop dusting, this Beaufort is spraying a special DDT solution in tests by the Victoria Dept. of Agriculture against insect pests that are ravaging fruit crops in Australia.

News in Brief

ACCORDING to official statistics issued by the Department of Industry and Commerce in Dublin the total value of aircraft and parts imported into Eire during last year was £15,127, compared with £26,856 in the previous year.

* * *

The Government factory built during the war at Sherburn-in-Elmet, near Leeds, for the production of Swordfish for the Fleet Air Arm, has been allocated to the Birmingham firm of W. & T. Avery, the well-known makers of scales and weighing apparatus.

* * *

Fifty airfields available for post-war use have been declared surplus by the R.C.A.F. and are now either being rented to municipalities, or returned to municipalities from which they were requisitioned. Those being rented are let at a nominal fee of $1 on a five years' lease.

The first Skymaster of Australian National Airlines recently flew the 8,075 miles from San Francisco to Melbourne in 30hr. 51min. flying time. The final stage of 2,222 miles from Suva was flown non-stop. After a visit to capital cities, this Skymaster will operate on the Melbourne-Perth service. Three more aircraft of the same type are expected within the next three months.

* * *

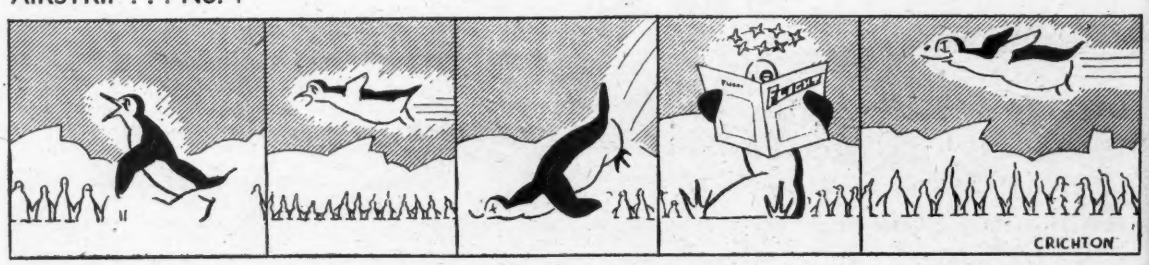
The Canadian Air Minister, Col. the Hon. C. W. Gibson, recently stated that R.C.A.F. establishments overseas were being scaled down as rapidly as possible. "It is certainly not our intention to keep any man overseas any longer than is absolutely necessary," he is reported as saying. "The R.C.A.F. contribution to the occupational force will begin withdrawing at the end of June, and it is expected all personnel will be repatriated by the end of September, 1946."

By the end of June next, 711,000 out of a total of 1,110,000 men and women serving with the R.A.F. on VE-Day will have been demobilized in just over a year. Giving these figures in a recent broadcast Mr. Strachey, Under-Secretary for Air, said that the R.A.F. was now one group ahead of the Army, and had released a greater proportion of its total strength than had the Navy in spite of the latter having reached groups in the forties.

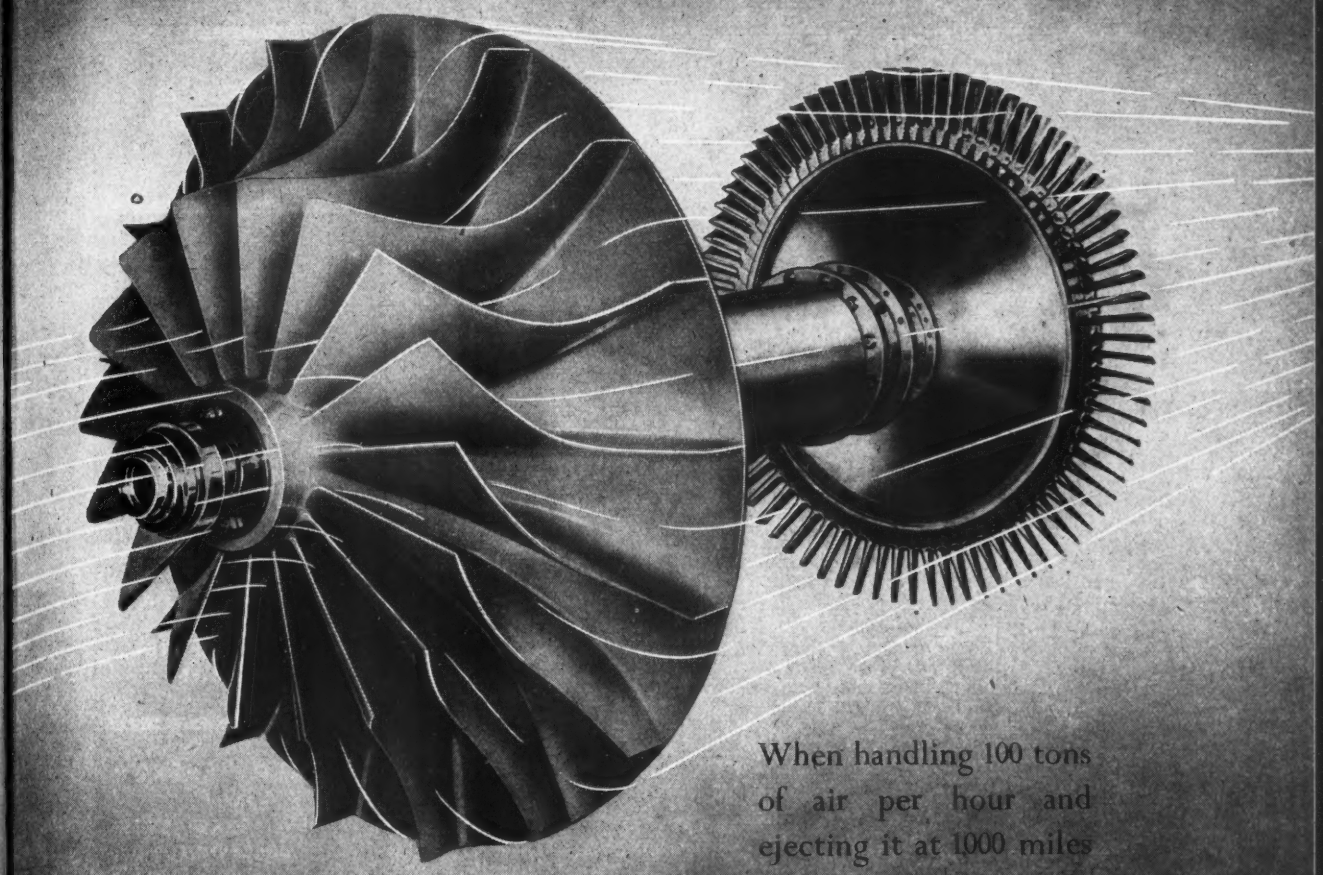
* * *

The condensed form of a news agency message from Bombay announcing the recent appointment of Air Vice-Marshal Sir Edward Rice may possibly have caused some confusion with another existing appointment. We are asked by the Office of the High Commissioner for India to point out that the full official title of Sir Edward's new post in India is Deputy Director-General, Civil Aviation (Aircraft Operation). Sir Edward was formerly A.O.C. in West Africa.

AIRSTRIP . . . No. 1



Minimum diversion of gas flow



When handling 100 tons of air per hour and ejecting it at 1000 miles per hour it obviously pays to minimise the changes of direction of the flow

Straight to compressor, straight-through combustion, direct ejection

DE HAVILLAND high-efficiency JET ENGINES

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Freighter and Wayfarer

Bristol Type 170 Described : "Bread and Butter" Cargo or Passenger Aircraft : Simple Construction and Easy Maintenance

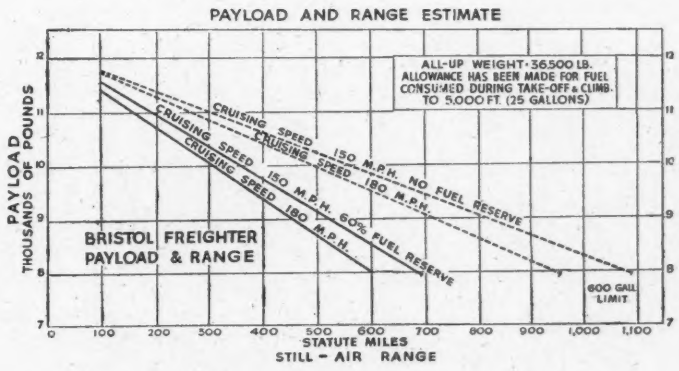
IT is interesting and even useful to speculate sometimes on the lines which civil aircraft development might have taken had aviation been left to "fly by itself," and had there not been two major wars to force the growth along certain definite channels. In all probability design might have become stabilised in two particular directions. A series of high-efficiency aircraft might have been developed for long-range travel at very much more than surface first-class fares, but the vast majority of aircraft in use would have been "bread-and-butter" types intended to carry a maximum load at the lowest possible fares over comparatively short distances. While the former series would be used only for long-distance travel and mail-carrying, the latter would have done all the short-distance work and been used on slower short-stage services over the longer distances where speed was not of paramount importance and where costs must necessarily be kept down.

The ordinary member of the public has now, rightly or wrongly, been taught to expect the benefits of all the items which contribute to sheer aerodynamic efficiency. There is, in fact, a tendency to lose touch with realities when planning civil aircraft. Although speed—provided that stage-lengths are carefully planned—is by no means as expensive as it was once thought to be, it is still very costly when used unnecessarily over stage-lengths shorter than, say, 800-1,000 miles.

No doubt there will be criticism of an aircraft which has all the appearance of being, from the design point of view, a step backwards, but there should also be an equal amount of praise for an effort in common sense and, for many purposes, necessary retrogression.

The Bristol type 170 is not intended for work on long-stage well-prepared air routes, but for high-frequency services over comparatively short distances, and in circumstances where it is essential that aircraft operation should be a financially favourable proposition. It was originally designed as a freighter pure and simple, and it was only later that its possibilities as a short-range passenger-carrying aircraft were considered. Every effort was made to provide adequate and useful internal volume so that the aircraft could be used for carrying the bulky cargo which has not previously been seriously considered by designers.

During the war very considerable freight loads were carried by aircraft not designed for the purpose, and there was inevitably a considerable wastage of man-hours in the work of breaking down and rebuilding large items which could not be stowed or loaded in one piece, even though the aircraft might have been quite capable of carrying the load involved. Since, also, there is not much object in providing adequate interior space if there is only a small and inconveniently placed side door, the designers of the Freighter have arranged the cargo entrance in the nose. The control cabin—now commonly known as the "flight deck"—is above the fuselage proper, so that it is not in the way and fully justifies its modern and somewhat euphuistic designation. The passenger version, or Wayfarer, is also entirely similar to the Freighter, though the hydraulically operated doors in the nose are replaced by a permanent shell, and the area concerned is partitioned off and can be used as a freight hold or as a steward's galley.


PAYLOAD AND RANGE ESTIMATE
ALL-UP WEIGHT 36,500 LB.
ALLOWANCE HAS BEEN MADE FOR FUEL CONSUMED DURING TAKE-OFF & CLIMB TO 5,000 FT. (25 GALLONS)
CRUISING SPEED 150 M.P.H. NO FUEL RESERVE
CRUISING SPEED 150 M.P.H.
CRUISING SPEED 150 M.P.H. 60% FUEL RESERVE
CRUISING SPEED 180 M.P.H.
BRISTOL FREIGHTER PAYLOAD & RANGE
600 GALL LIMIT
PAYLOAD THOUSANDS OF POUNDS
STATUTE MILES STILL-AIR RANGE
0 100 200 300 400 500 600 700 800 900 1,000 1,100
7 8 9 10 11 12

Although not initially designed for passenger-carrying, many of the original features of the 170 will prove to be advantageous. The small ground angle, for instance, and

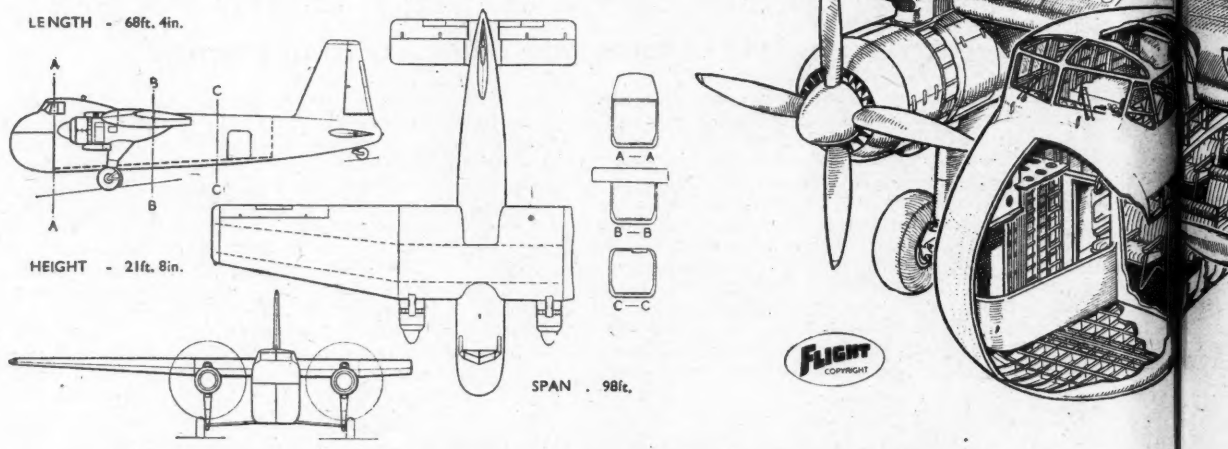
FREIGHTER AND WAYFARER

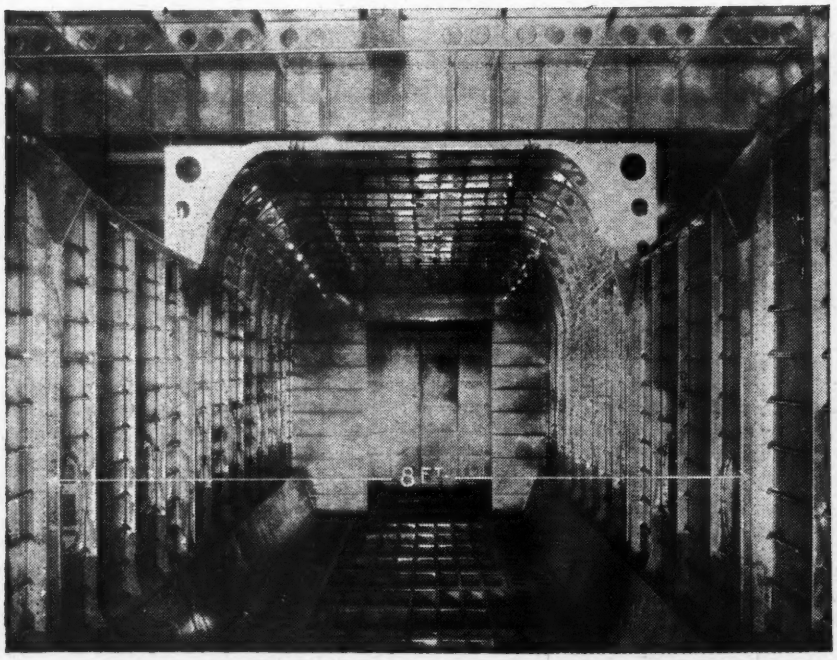
the fuselage spaciousness will be appreciated by the passenger. The high-wing arrangement, largely necessitated by low-level requirements in an aircraft with a conventional undercarriage, will give the passengers a field of view which is so often sadly missing in modern civil types.

From the structural angle the outstanding feature of the 170 is that of simplicity. To assist both in manufacture and maintenance, as many parts as possible of the same shape and size have been used. For instance, most of the fuselage frames are made up of four standard corner pieces joined by straight lengths of channel section, and identical and therefore easily replaced. The Hercules 131 power plants are quickly detachable, complete with cowlings, oil tank and cooler, air cleaner, and all accessories.

In order to provide the maximum useful capacity and for the sake of simplicity, the fuselage is of a "rounded rectangular" section. Except in the nose and tail portions, there are no double curvatures in the skin, so that repairs will be easy; and the structure consists simply of the standard frames, stringers and skin. For centre-section attachment, two of the frames are "doubled" to provide box-type members which, suitably reinforced, carry the two wing spars. The forward roof of the fuselage proper forms the floor of the crews' compartment. The fuselage main floor structure is of deep transverse beams with intercostals of the same section, and on each side is a longitudinal strip, strengthened by a supporting beam, to permit the transport of vehicles with a maximum axle load of 5,000 lb. Over this skeleton structure is a wood floor made in panels so that any section can easily be removed and re-placed.

The capacity of the main hold is 2,020 cu ft. Aft of this are two structural bulkheads each with a door through which the interior of the tail portion may be reached for inspection. The stub spars of the detachable tailplane, and mountings, the fin and tail wheel are carried on other bulkheads.





Some idea of the useful volume of the Freighter's "hold" can be obtained from this photograph of the structure, looking towards the rear.

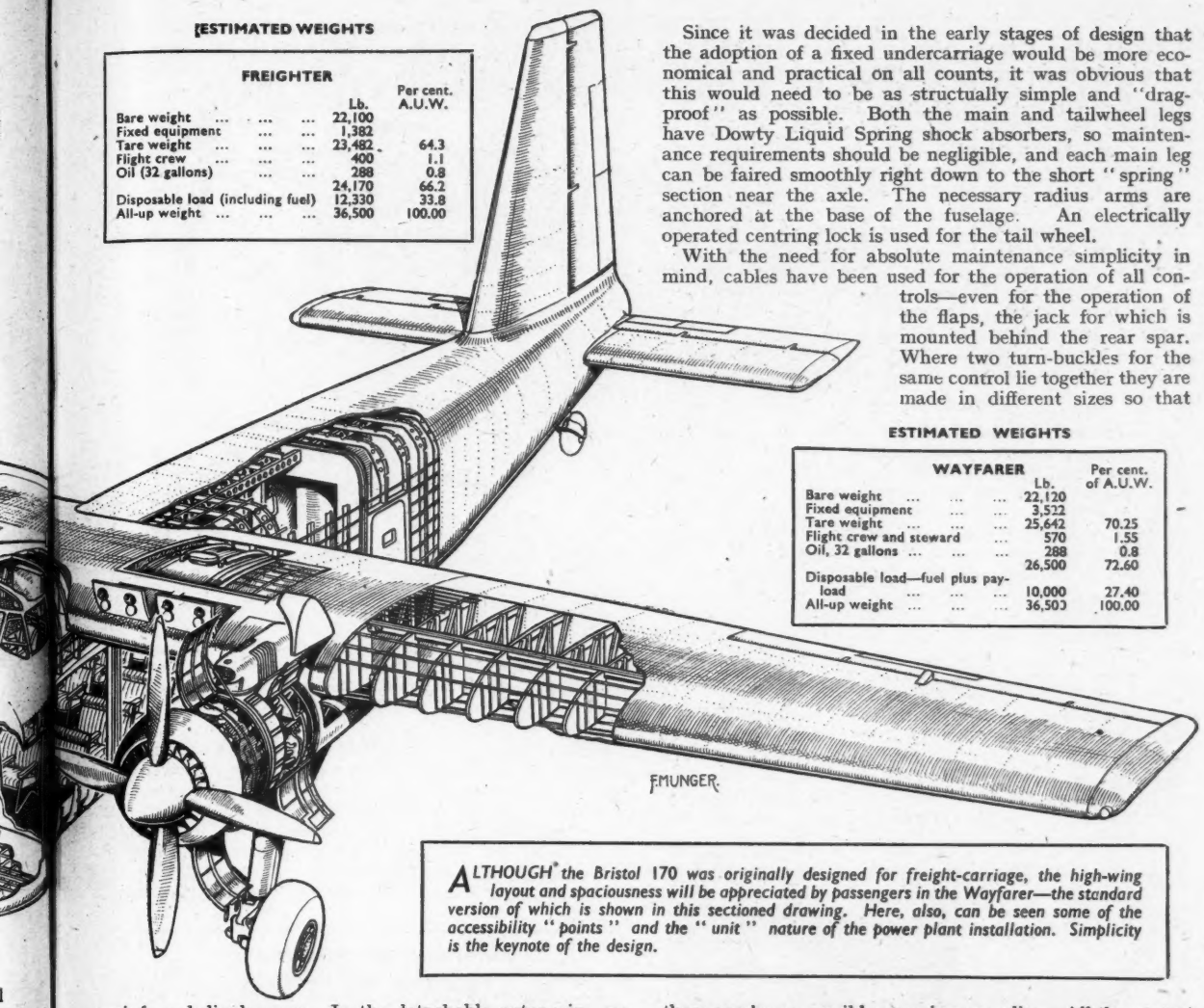
Simplicity

The wing is equally straightforward and of normal Bristol construction, being built up on two spars made up of heavy extruded booms joined by stiffened diaphragm webs, with, at the centre section, diaphragm ribs spaced by intermediate contour members acting as stiffeners. The ribs carrying the power plants are girder-

ESTIMATED WEIGHTS

FREIGHTER

	Lb.	Per cent. A.U.W.
Bare weight	22,100	
Fixed equipment	1,382	
Tare weight	23,482	64.3
Flight crew	400	1.1
Oil (32 gallons)	288	0.8
	24,170	66.2
Disposable load (including fuel)	12,330	33.8
All-up weight	36,500	100.00



ALTHOUGH the Bristol 170 was originally designed for freight-carriage, the high-wing layout and spaciousness will be appreciated by passengers in the Wayfarer—the standard version of which is shown in this sectioned drawing. Here, also, can be seen some of the accessibility "points" and the "unit" nature of the power plant installation. Simplicity is the keynote of the design.

Since it was decided in the early stages of design that the adoption of a fixed undercarriage would be more economical and practical on all counts, it was obvious that this would need to be as structually simple and "drag-proof" as possible. Both the main and tailwheel legs have Dowty Liquid Spring shock absorbers, so maintenance requirements should be negligible, and each main leg can be faired smoothly right down to the short "spring" section near the axle. The necessary radius arms are anchored at the base of the fuselage. An electrically operated centring lock is used for the tail wheel.

With the need for absolute maintenance simplicity in mind, cables have been used for the operation of all controls—even for the operation of the flaps, the jack for which is mounted behind the rear spar. Where two turn-buckles for the same control lie together they are made in different sizes so that there can be no possible error in recoupling. All the control surfaces are fabric covered, both for lightness and ease of replacement.

ESTIMATED WEIGHTS

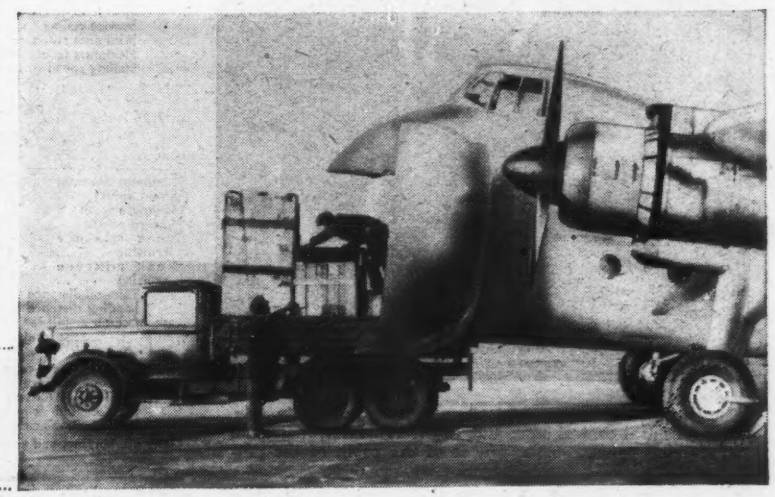
WAYFARER

	Lb.	Per cent. of A.U.W.
Bare weight	22,120	
Fixed equipment	3,522	
Tare weight	25,642	70.25
Flight crew and steward ...	570	1.55
Oil, 32 gallons	288	0.8
	26,500	72.60
Disposable load—fuel plus pay-load	10,000	27.40
All-up weight	36,500	100.00

reinforced diaphragms. In the detachable outer wing sections the majority of ribs are of the girder type made up of standard channel sections, while there are diaphragm ribs at wing-joint and aileron hinge stations. There are no fuel tanks or hydraulic pipelines in the outer wings.

The two 300-gallon fuel tanks, each in 150-gallon halves, are carried in inter-spar bays inboard of the power units, with a connecting balance-pipe; as a consequence, the fuel system is extremely simple. Actually, the tanks are high enough to provide a gravity feed, but there are, of course, electric immersion pumps and the system is designed for pressure refuelling. In the prototype the engine priming is by means of Ki-gass pumps in the nacelles, but later aircraft will be fitted with an electrically operated system with the switches in the cockpit.

In the prototype, at least, the control tab system appears to be somewhat complicated for an aircraft of moderate



Convenient and practical loading arrangements, with a conventional layout, are a feature of the Freighter. The nose doors are to be hydraulically operated.

FREIGHTER AND WAYFARER

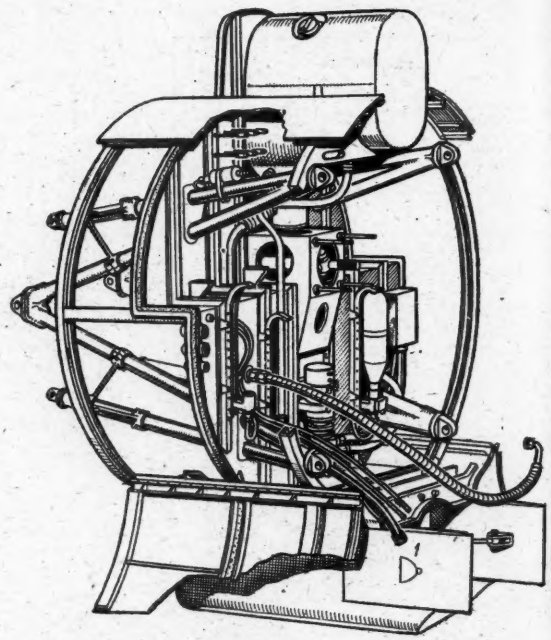
speed-range, but this may be simplified in the production aircraft. There are spring tabs both on the elevator and the rudder, plus a normal trimmer tab on the former and a reverse servo-cum-trimmer tab on the latter. Separate geared-servo and trimmer tabs are fitted to each of the ailerons. As a matter of interest, the only real troubles experienced during the Freighter development test work have been concerned with control characteristics and, initially, the fore and aft control situation was further involved by the fact that the tailplane position was already known to be too high. The original design was for Perseus engines and, pending the results of further wind-tunnel tests on the Hercules engined version, work on the original structure was continued.

Power Services

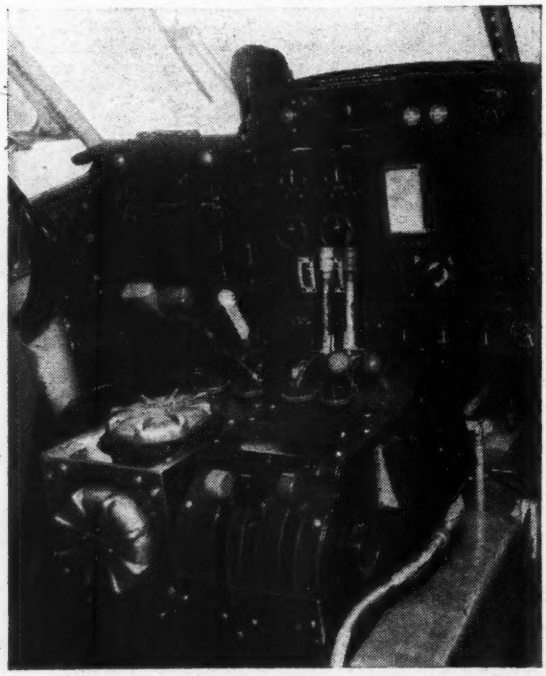
An electro-hydraulic system is used for the operation of the only two services which require power—the freight doors and the flaps. The Wayfarer has a 24-volt generator in each nacelle, and an electrically driven hydraulic pump unit, mounted in the aft part of the control cabin, supplies the power; a hand-pump being provided for use in case of a power failure. So that the freight doors may still be operated on the ground without excessive loading on the accumulator, the Freighter version has only one engine-driven generator, a second being driven by an auxiliary power unit in the control cabin. Here, also, is a combustion heater for the crew of the Freighter, with a second and larger heater for providing the necessary cabin warmth in the passenger-carrying Wayfarer.

Throughout the design of the 170 it is obvious that a major effort has been applied to the problems involved in assuring both a quick turn-round when in use, and rapid and easy servicing generally. There are ample inspection panels, each of which has a quick-action thumb-operated locking catch, and, wherever possible, these panels are conveniently placed both from the working and accessibility point of view. Above the leading edges between power unit and fuselage are large hinged doors through which the control cables and incidental pipelines can be reached for inspection; and hinged panels, with built-in jury struts, are arranged in the engine cowlings so that casual inspection and attention are simplified.

As already explained, the engines and their accessories



A four-point, quick-release engine-mounting, rationalised control, electrical and pipeline connections, and "unit" installation of ancillaries make the work of engine-changing a simple matter.



The control cabin layout of the 170 is exceptionally tidy, with a central control bank and, in the Wayfarer, individual blind-flying panels. This view is of the cabin of the prototype.

DIMENSIONS AND PERFORMANCE

FREIGHTER AND WAYFARER
2 Bristol Hercules 131 (take-off power 1,675 b.h.p. each)

ESTIMATED DATA

Maximum all-up weight	36,500 lb.
Span	98ft.
Length	68ft. 4in.
Height (over fin)	21ft. 8in.
Wing area	1,405 sq. ft.
Wing loading	26 lb./sq. ft.
Geometric mean chord	14ft. 4in.
Span loading ratio	3.8
Service ceiling	20,000ft.
Maximum still-air range (at 140 m.p.h.)	1,085 miles
Maximum level speed (at 8,000ft.)	236 m.p.h.
Stalling speed (flaps up)	85 m.p.h.
" " (flaps down)	73 m.p.h.

PERFORMANCE AT FULL LOAD

	Altitude feet	B.H.P. per engine	Level speed m.p.h.	Fuel consumption galls./hour
Maximum power	Sea level	1,675	215	363
(5 min. limit)	5,000	1,745	230	379
Maximum weak	Sea level	1,175	190	138
Mixture power	5,000	1,230	200	143
Weak mixture cruising	5,000	960	180	109
Weak mixture cruising	5,000	700	150	80

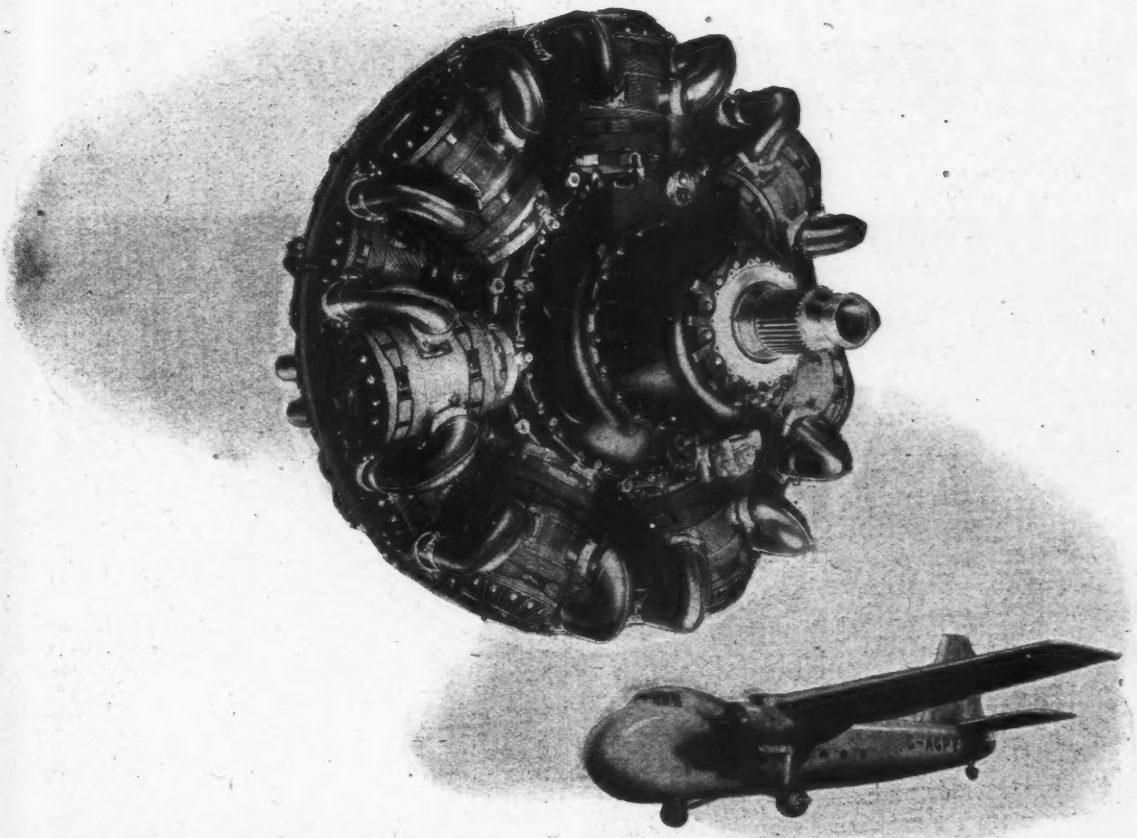
Take-off distance to clear 50ft. barrier (concrete runway) ... 650 yds.
Landing distance over 50ft. barrier (concrete runway) ... 700 yds.
Rate of climb at full load and max. continuous power :
sea level ... 1,135ft./min.
5,000ft. ... 1,130ft./min.

Single-engine Performance (airscrew feathered)

Take-off distance to clear 50ft. barrier with one engine failed at "unstick" (on concrete runway) ... 1,050 yds.
Rate of climb at maximum power at sea level ... 310ft./min.
Rate of climb at rated power at 5,000ft. ... 115ft./min.

(Take off, landing, and single-engined performance estimates are based on a head-wind not exceeding 5 m.p.h.)

on the HERCULES *engines...*



of the Bristol Freighter

During the war over one million Wellworthy Pistons and many millions of Wellworthy Rings were supplied to leading Aircraft Engine Builders. The confidence engendered by their outstanding performance in battle now makes them the first choice for every type of engine in peace.

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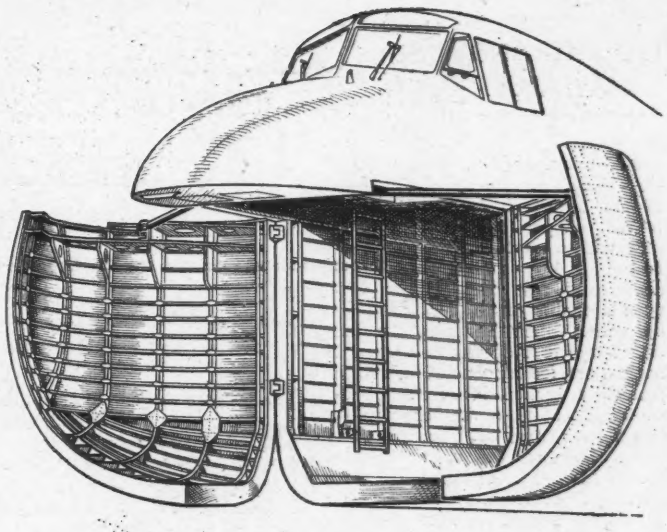
FREIGHTER AND WAYFARER

and cowlings can be removed and replaced as units, and, with good organisation in the working party, a complete engine change should be possible in very much less than 90 minutes. The power plants are held at only four points, each of which has a quick-release bolt, and, since the lubrication system and all accessories are part and parcel of the unit, there is a minimum number of other items to be disconnected. The throttle, engine speed and engine cut-out control cables all have, at the point of unit attachment, ingenious quick-release couplings which permit the load to be released and the cable freed without upsetting the adjustment. In addition to these cables, there is a single fuel pipe and a vacuum pipe union to be disconnected, while the various electric connections for the starter instruments, priming circuit and ignition are all that remain, plug-in points being used wherever possible.

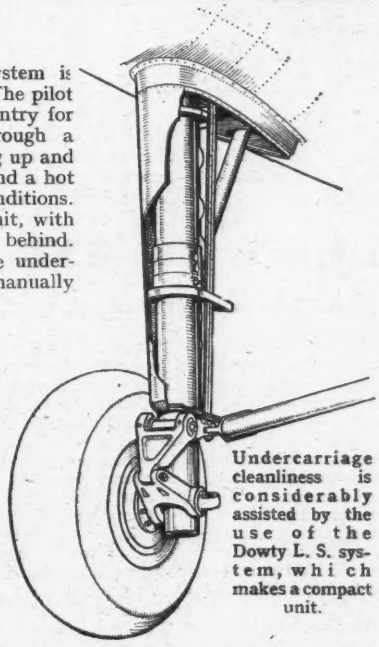
Good View

A three-way carburation intake system is employed, with an electrical control. The pilot has the choice, therefore, of "ram" entry for normal flying conditions; entry through a Vokes filter when necessary for running up and taking off in "tropical" conditions; and a hot air entry for cold weather and icing conditions. The intake and filter are above the unit, with the oil tank faired in immediately behind. Below the engine, and faired into the undercarriage, is the Serck oil cooler with manually operated flaps.

As might be expected with a control cabin placed as high as it is in the 170, the all-round view for the crew is exceptionally good, and the screening arrangements have taken every advantage of the good initial situation. The two main screens, with glycol sprays and wipers, are flat, deep and only slightly sloping; there is a small but useful area of transparency at the forward end of the roof; further, a large clear-vision panel is provided on each side, and there are two deep sliding windows with catches which permit them to be locked in any position.



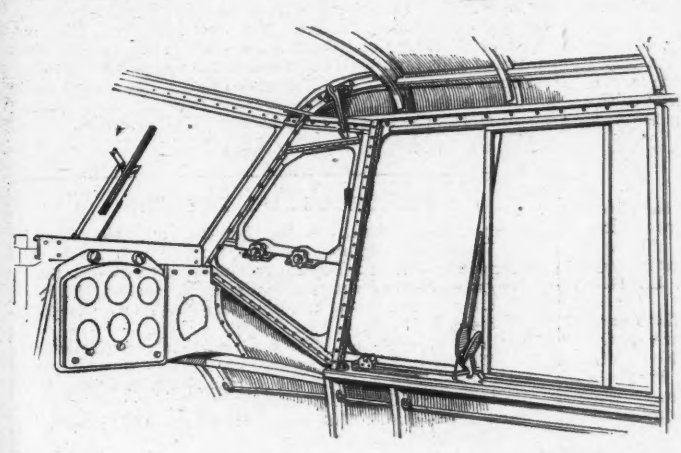
Full-width direct entry for the cargo is provided through the nose of the Freighter.



Undercarriage cleanliness is considerably assisted by the use of the Dowty L. S. system, which makes a compact unit.

The control and instrument layout is quite the best we have seen in any Bristol aircraft, with all operating essentials arranged in a large control box between the two pilots. The three trimming controls work very smoothly and in the correct "sense." Throttles, engine speed, and cut-out controls move comfortably even when damped, and the throttles themselves are long enough to be well clear of the speed control levers and so provide accuracy of control when "weaving" to the take-off setting. The prototype Wayfarer is fitted with a Sperry automatic pilot, and the panel concerned is in the centre of the dash, with an individual standard blind-flying panel for each pilot. The instrument arrangements will, of course, vary according to the operators' requirements. Gill opening, priming, starting and air intake setting switches are on the left with indicators for the gills.

The disposition and number of the crew will naturally vary according to operational requirements, but, in addition to the first pilot and second pilot or radio operator, there is accommodation at the rear of the control cabin for a third crew member whose quarters will be adequate if not particularly comfortable. The flight deck is reached by a permanent ladder which folds flush with the fuselage inside when not in use, and the crew may enter through a small door on the starboard side when the forward freight doors are closed.



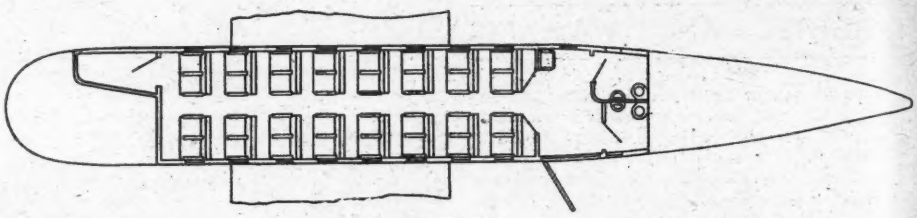
Deep screens and good-sized bad-weather windows will be appreciated by the pilot of the 170. Wipers and glycol sprays are standardised.

Operating Costs

There are two fuselage hatches, one in the roof at the rear of the crews' compartment and another in the roof of the hold or passenger compartment. In the Wayfarer two of the forward windows are in quickly removable frames and can be used for exit in emergency.

Some of the costing figures for air freighters, and for the Bristol 170 in particular, were given in *Flight* of February 15th, 1944. Costs have

FREIGHTER AND WAYFARER



The normal 32-seater version of the Wayfarer shown in plan form. Each pair of passengers ha their own window.

CARGO COMPARTMENT DIMENSIONS

VOLUME	
Main compartment	2,020 cu. ft.
Rear compartment	340 cu. ft.
LENGTH	
Main compartment	31ft. 8in.
Rear compartment	8ft. 4in.
Inside main doors	7ft. 6in.
WIDTH	
Main compartment	6ft. 9in.
Main compartment (24in. above floor)	8ft. 0in.
AREA	
Main compartment	215 sq. ft.
Minimum headroom	6ft. 8in.
Height of door sill from ground ...	4ft. 6in.

been worked out by the makers and should approximate to 12s. 6d. per ton/mile with a payload factor of 65 per cent., and 10s. 2d. with a factor of 80 per cent.—when assuming a utilisation figure of 2,000 hours a year in normal service conditions. Since the passenger version could not be expected to have a higher payload factor than, say, 62½ per cent., and when allowance has been made for the additional costs associated with passenger services, the Wayfarer equivalent should be about 2d. per passenger mile for 200-mile stages at a block speed of 152 m.p.h. with the 32-passenger version.

Naturally enough, with such a large cabin capacity available, there can be a high degree of versatility in use, and there is no reason why the 170 should necessarily be used exclusively for freight or passenger carrying; the aircraft can be laid-out, if required, in "combination" form and for many other purposes, and, for short-range passenger carrying, a maximum seating capacity of 40 can be arranged.

An "official" order for thirteen Wayfarers and twelve Freighters has already been announced, and this order, though small, should keep the firm usefully busy during the development period and while other markets are being explored. Although likely to be a good proposition for certain short-stage routes in the European area, it might be thought that the primary value of the type would be in passenger and freight haulage in parts of the world where normal communications are difficult. For such work the freighter was, presumably, originally conceived, and its production will only be fully justified when it is in service abroad.

R.N.Z.A.F.'s SECOND V.C.

Daylight Raid on Amsterdam Power Station

SQUADRON LEADER LEONARD HENRY TRENT, D.F.C., of No 487 R.N.Z.A.F. Squadron, Bomber Command, has been awarded the Victoria Cross for his part in the daylight raid on Amsterdam power station in May, 1943.

The citation reads:—

"On May 3rd, 1943, Sqn. Ldr. Trent was detailed to lead a formation of Ventura aircraft in a daylight attack on the power station at Amsterdam. This operation was intended to encourage the Dutch workmen in their resistance to enemy pressure. The target was known to be heavily defended. The importance of bombing it, regardless of enemy fighters or anti-aircraft fire, was strongly impressed on the air crews taking part in the operation. Before taking off, Sqn. Ldr. Trent told the deputy leader that he was going over the target whatever happened.

"All went well until the eleven Venturas and their fighter escort were nearing the Dutch coast. Then one bomber was hit and had to turn back. Suddenly large numbers of enemy fighters appeared. Our escorting fighters were hotly engaged and lost touch with the bombing force. The Venturas closed up for mutual protection and began their run up to the target. Unfortunately, the fighters detailed to support them over the target had reached the area too early and had been recalled.

"Soon the bombers were attacked. They were at the mercy of 15 to 20 Messerschmitts which dived on them incessantly. Within four minutes six Venturas were destroyed. Sqn. Ldr. Trent continued on his course with the three remaining aircraft. In a short time two more Venturas went down in flames. Heedless of the murderous attacks and of the heavy anti-aircraft fire which was now encountered, Sqn. Ldr. Trent completed an accurate bombing run and even shot down a Messerschmitt at point blank range.

"Dropping his bombs in the target area, he turned away. The aircraft following him was shot down on reaching the target. Immediately afterwards his own aircraft was hit, went into a spin and broke up. Sqn. Ldr. Trent and his navigator were thrown clear and became prisoners of war. The other two members of the crew perished.

"In this, his 24th sortie, Sqn. Ldr. Trent showed outstanding leadership. Such was the trust placed in this gallant officer that the other pilots followed him unwaveringly. His cool, unflinching courage and devotion to duty in the face of overwhelming odds rank with the finest examples of these virtues."

This is the 17th V.C. to be awarded during the second world war. It is the eighth won by a member of the New Zealand Forces and the second by a member of the R.N.Z.A.F.

NEW DIRECTOR FOR I.Ae.Sc.

CAPTAIN S PAUL JOHNSTON, U.S.N.R., has been appointed director of the Institute of the Aeronautical Sciences, the American equivalent of our R.Ae.S., and will take up his new post in April. He will not at present succeed Mr. Lester Gardner but will work with him until his (Mr. Gardner's) retirement.

Capt. Johnston is one of the many graduates of the Massachusetts Institute of Technology who have won fame in the aviation world. He joined the editorial staff of our New York contemporary, *Aviation*, in 1930 and became its editor in 1936. In 1940 he was appointed Co-ordinator of Research of the N.A.C.A. and also did work on the War Production Board. After a period in the Naval Air Transport Service in the Pacific he became Deputy-Director, Aircraft Division, U.S. Strategic-Bombing Survey, serving in England, Germany, France and Japan. For this work he was awarded the Legion of Merit.

FORTHCOMING EVENTS

March 12th.—R.Ae.S., Belfast branch; "Model Tank Testing of Flying-boat Hulls and Floats," by L. Smith.

March 13th.—*R.Ae.S. (London); Full-day discussion on the gas turbine with papers by Dr. S. G. Hooker, Dr. H. Ricardo, Mr. R. M. Clarkson, and Mr. W. G. Carter. Starts at 11 a.m.

March 20th.—**R.Ae.S. Graduate and Students Section; "Radar" (Film show).

March 28th.—*R.Ae.S., "The Electrical Measurement o. Strain," by Dr. S. C. Redshaw.

March 28th.—R.A.F. Club annual meeting at 128 Piccadilly, London, W.1, at 6 p.m.

* Lecture Hall, Institute of Civil Engineers, Gt. George St., S.W.1.
** The Library, 4 Hamilton Place, W.1.

FIREBRAND IV

This useful Blackburn aircraft is equipped with Lockheed hydraulic undercarriage and retracting gear. In addition, the flaps and dive brakes, the torpedo beam gear, the undercarriage and tail wheel struts with their doors, and certain engine services, are all controlled by the Lockheed high-pressure hydraulic installation.

The components are neatly grouped and an accumulator is used to store energy for emergency operations and to provide rapid retraction of the undercarriage, which is effected in two seconds, including closing the doors. The whole of this comprehensive hydraulic system, complete with pipings and clips, is less than 1 per cent. of the all-in weight and the installation has been specially commended officially for its accessibility.

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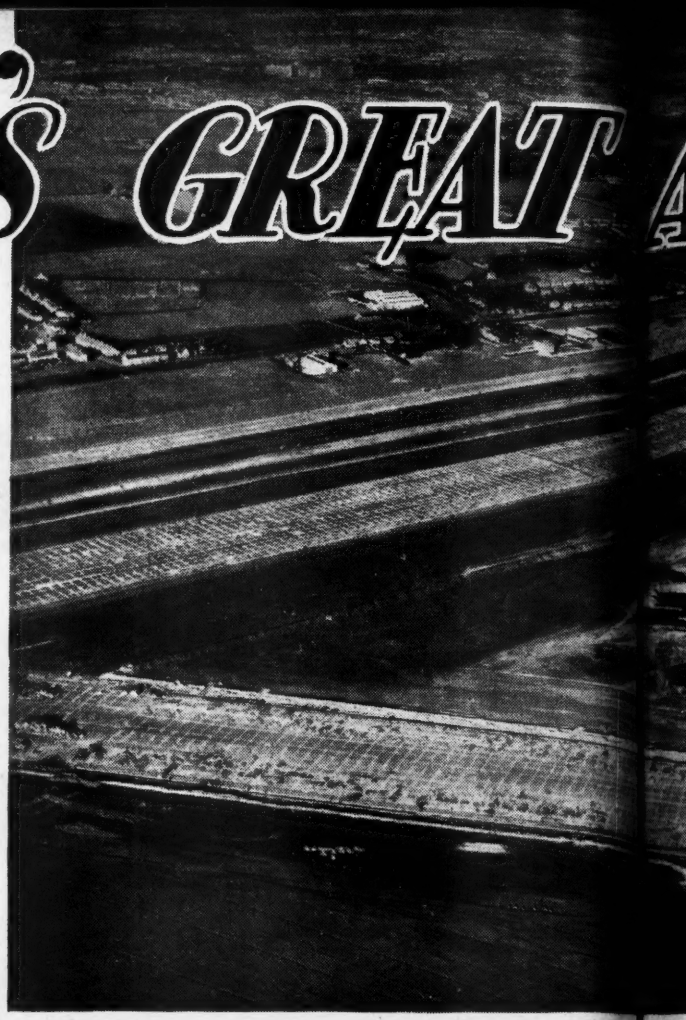
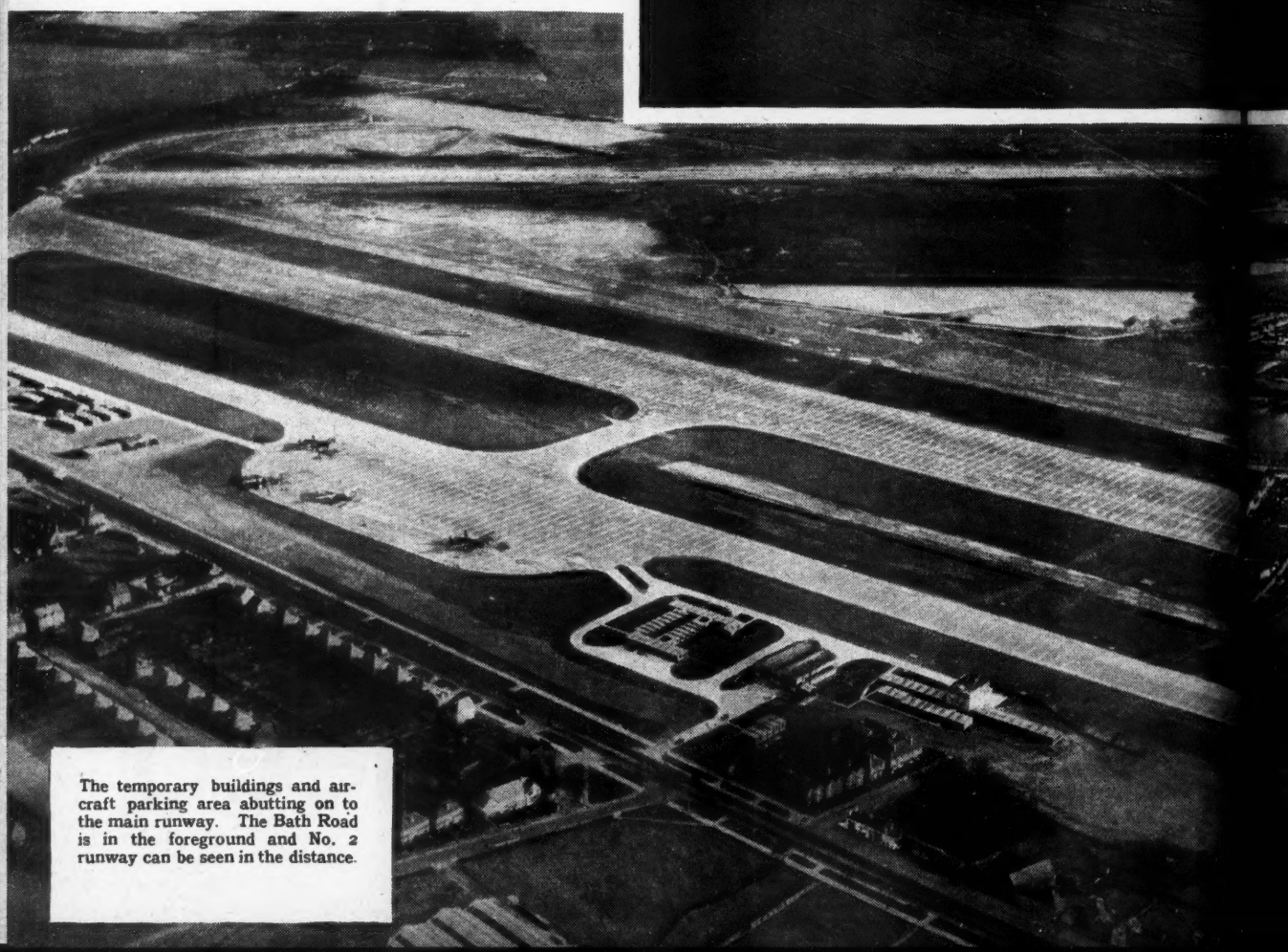
LONDON'S GREAT A



AT the present time, almost the only thing about London's new airport at Heathrow which can honestly be described as "great" is the extent of the site which it covers, but there is no doubt that its potentialities are tremendous.

As can be seen from the accompanying aerial photographs taken last week, progress on the runways is continuing steadily, but whether or not it will be maintained or quickened no one can say, except those who are able to sway the granting of priorities in labour and material. Whatever happens, however, the task of completing this airport is prodigious.

When, on January 1st, the Minister of Civil Aviation forecast the time required to complete enough of the necessary work to enable Heathrow to be used as an airport, he ventured "midsummer" as a possible date for full-scale operations. We have never believed for an instant that there is any hope that the airfield can be taken into everyday use as a major airport for many months, but it is, nevertheless, pleasing to note that at least one part of Lord Winster's forecast has been fulfilled. He said that the second runway would be

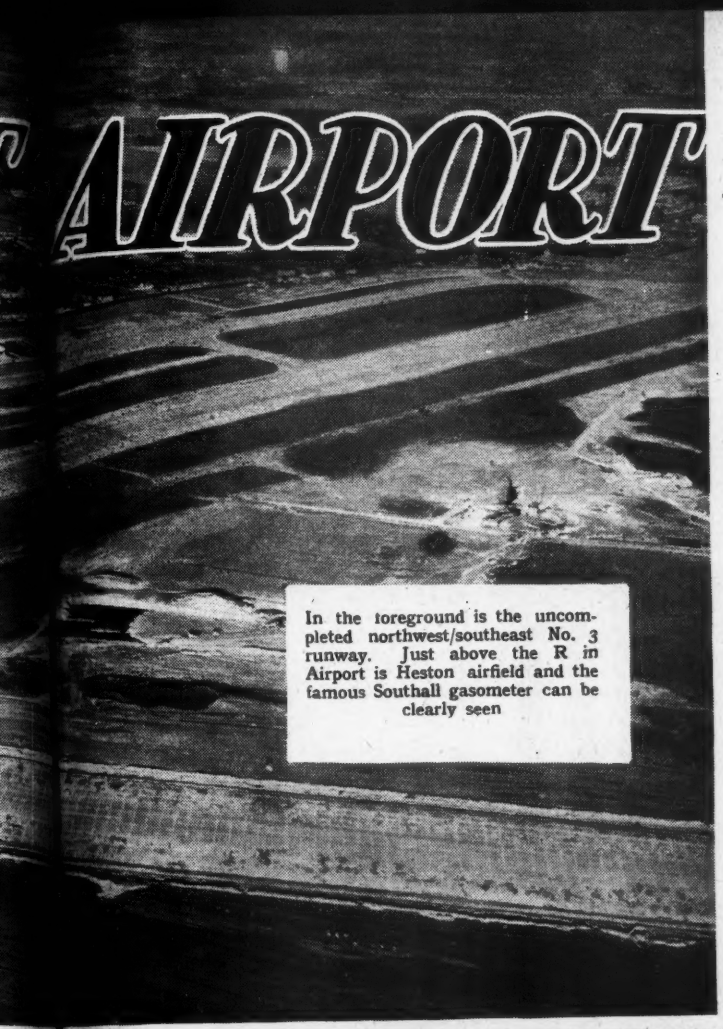


The temporary buildings and aircraft parking area abutting on to the main runway. The Bath Road is in the foreground and No. 2 runway can be seen in the distance.

AIRPORT

New Photographs of Heathrow Show Magnitude of Work Yet to be Completed

These exclusive "Flight" photographs were taken from a helicopter which was able to hover at each viewpoint



In the foreground is the uncompleted northwest/southeast No. 3 runway. Just above the R in Airport is Heston airfield and the famous Southall gasometer can be clearly seen

completed by the end of February, and, in fact, it is about ready for use. The third runway of the three at present under construction should be ready by July.

The initial airfield scheme provides for only three runways—two of 2,000 yards and one of 3,000 yards. All three are 100 yards wide, and all the approaches are unobstructed. In the ultimate scheme, additional land to the north of the existing main runway will be taken over. The expanded site will enable all runways to be extended and widened as required, and additional runways to be constructed. The final plans for the layout of the airfield have not been made public. Taxying tracks are, at present, non-existent, except for one return track parallel with the main runway.

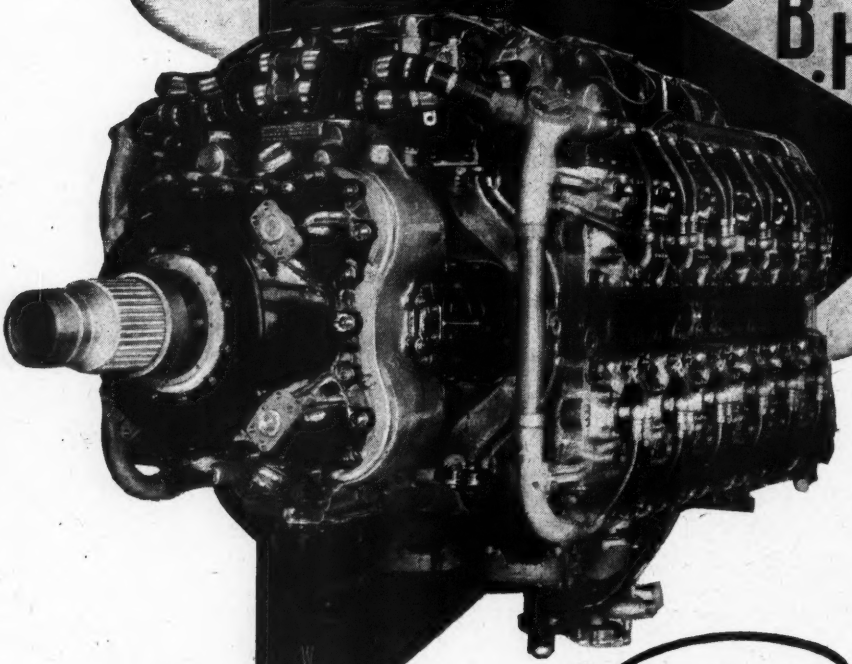
Facilities for handling passengers, freight and aircraft are at present meagre, and those buildings which do exist are constructed to temporary wartime standards only. The provision of permanent airfield buildings must clearly be regarded essentially as a long-term project, which will absorb a very large part of the ultimate cost of this airport if the buildings are designed to a scale appropriate to the standing of an Empire air terminal.

Looking straight down the 3,000-yd. No. 1 runway from the western end. This runway is 100 yds. wide and is sited almost exactly east-west

TYPE TESTED AT

3000

FOR TAKE-OFF B.H.P



NAPIER "Sabre"

SERIES VII

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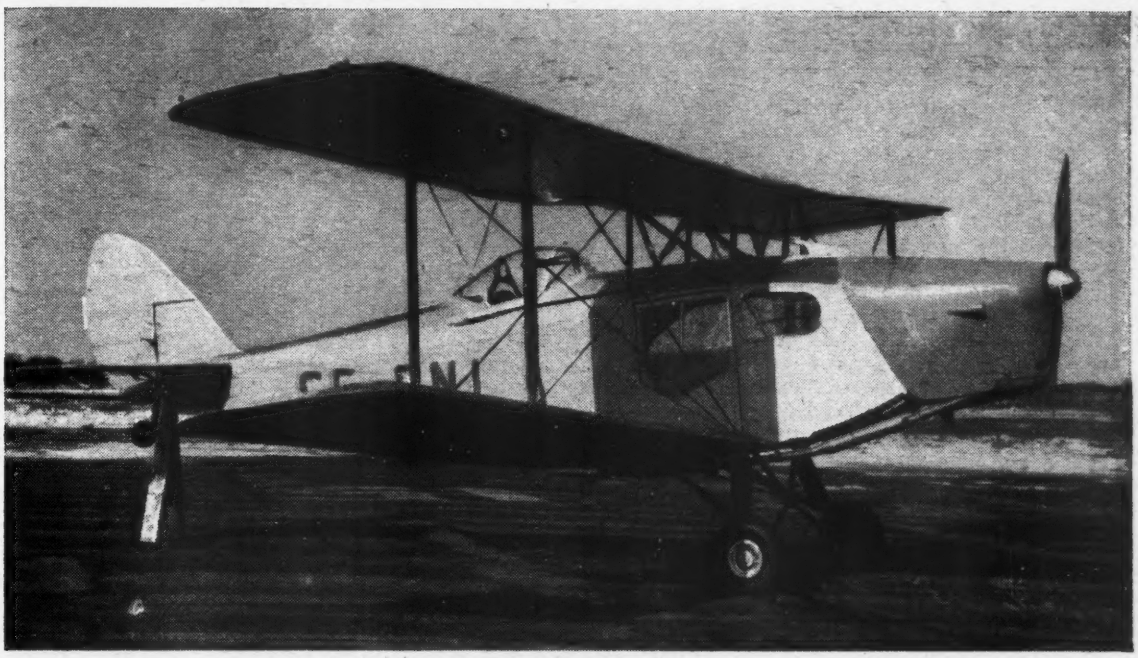
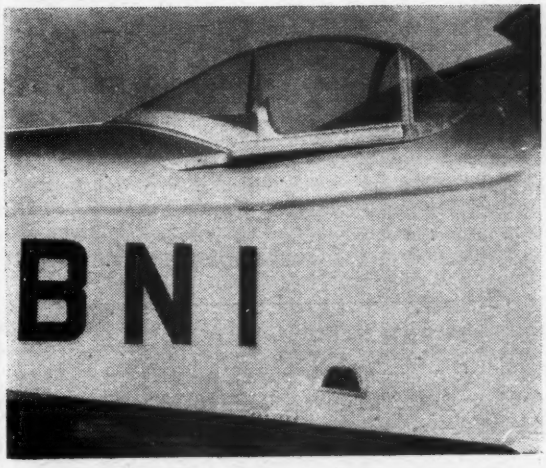


Canadian Fox Moth

Post-war Production of Economical Light Transport : Landplane, Seaplane and Skiplane Versions

ON the face of it, the re-introduction of a type which, in basic form, is some fifteen years old might appear to be peculiar. But utility and economy have an ageless value, and the fact that the D.H. Fox Moth was quite the most inexpensively operated small transport type is the all-important one. Conditions for aircraft operation in the tougher parts of the world have not appreciably altered during the fifteen years, and a simple and rugged aircraft with a low stalling speed, short take-off run and good load factor is still required in many areas, and could still do useful work even in this small country of ours with its already well-organized communication network.



The new sliding canopy for the larger cockpit of the post-war Fox Moth. The cockpit as well as the cabin is now heated.

The new Fox Moth which is now being built at the D.H. Toronto factory has been considerably improved in detail while losing none of its practical earlier features. The latest Gipsy Major engine gives something like 10 b.h.p. more than its pre-war counterpart, so that the take-off is improved—and this improvement will be further increased when the D.H. variable-pitch manually operated airscrew is available. Experience in the building of wooden aircraft has resulted in the appearance of still better structural methods and materials, such as improved plywoods and more durable cements, to stand up to extreme conditions.

Modernisation

Among the detailed improvements on the original Fox Moth is the provision of a larger sliding hood canopy with a three-point mounting and an almost frameless moulding with blistered sides. The cockpit is now heated, and the 41½in cabin door, once an "extra," has been standardized to assist in the loading of bulky freight. Luggage can also be stowed under the pilot's floor. A modern type of centrally hinged engine cowling will simplify maintenance, and an auxiliary 25-gallon tank may be installed in the baggage compartment at the back of the cabin. The original spring-loaded trim system for the elevator has been replaced by a conventional tab. During the war the Canadian-built Tiger Moths were fitted with wheel-brakes and a fully castoring tailwheel, and these features have been embodied in the new Fox Moth. In fact, the comparatively low price of the aircraft in Canada—$6,450 for the landplane—has been made possible by the similarity of so many of the

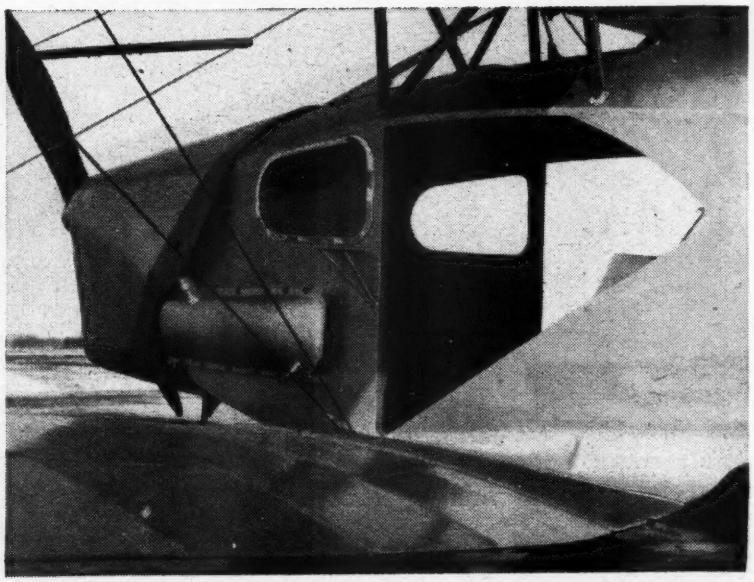
CANADIAN FOX MOTH

different parts in the two aircraft. There is now provision for electric starting.

In standard form the range of the landplane is 375 miles, but this can be doubled if the auxiliary tank is fitted. Fuel is normally fed from this to the top tank by wobble pump, but a direct-feed system by engine pump, may be installed.

When used as a passenger aircraft there is accommodation for three —two on a hammock-type seat forward, and one a chair-type seat facing aft. With the seats removed the cargo space is nearly 50 cubic ft. The payload is 500 lb. and 420 lb. for the landplane and seaplane respectively.

The Fox Moth can be used in conventional, floatplane or skiplane form, and there are "combination" fuselage fittings for all.



A very large loading door is provided on the port side. This view of the Fox Moth also shows the new type engine cowlings and the position of the oil tank.

D.H. 83c FOX MOTH

PERFORMANCE

	Landplane	Skiplane	Seaplane
Speed max. (s.l.)	110 m.p.h.	108 m.p.h.	96 m.p.h.
Cruising at 2,100 r.p.m.	96 m.p.h.	94 m.p.h.	84 m.p.h.
Fuel consumption (recommended cruising)	6.4 gal./hr.	6.4 gal./hr.	6.4 gal./hr.
Endurance (recommended cruising)	3.9 hr.	3.9 hr.	3.9 hr.
Range (recommended cruising) :			
25 gals.	375 miles	368 miles	328 miles
35 gals.	525 miles	515 miles	460 miles
50 gals.	750 miles	735 miles	656 miles
Stalling speed	52 m.p.h.	52 m.p.h.	54 m.p.h.
Take-off run	256 yd.	—	—
Landing run—no brakes	163 yd.	—	—
Rate of climb (s.l.)	525 ft./min.	510 ft./min.	450 ft./min.
Service ceiling	10,500 ft.	10,000 ft.	9,000 ft.

WEIGHTS

	Landplane	Skiplane	Seaplane
Empty weight (including standard equipment) :			
Pilot, fuel and oil	1,219 lb.	1,258 lb.	1,444 lb.
Payload	510 lb.	471 lb.	399 lb.
All up	2,100 lb.	2,100 lb.	2,214 lb.

DIMENSIONS (Landplane)

Length	25ft. 9in.
Span	30ft. 10½in.
Height	8ft. 5in.
Ground clearance	2ft. 2in. (flying position)
Cabin—5ft. 3in.—2ft. 9in.—3ft. 6in.	49.3 cu. ft.
Undercarriage track	6ft.
Wing loading	8.5 lb./sq. ft.
Power loading	15 lb./B.H.P.

U.S. FIRM'S TECHNICAL TRAINING INSTITUTE

TECHNICAL training courses for those of their youthful employees and apprentices adjudged capable of profiting thereby are provided by a number of British aircraft firms, but at least one American concern has gone a good deal further by inaugurating what is described as a "new type of school to train engineers and mechanics for the peacetime era of flight."

This is the Northrop Aeronautical Institute, which is to offer both home study and resident courses and will operate in new, specially designed buildings at Northrop Field, Hawthorne, near Los Angeles. It is being run as a special division of Northrop Aircraft Inc., and as a "placement bureau" to aid graduates in obtaining posts is part of the scheme it is clear that the institute is not intended exclusively for Northrop personnel.

James L. McKinley, who has had wide experience in the field of technical education, is to be director of the new institute, and the instructional staff will comprise engineering, production, service and training experts. The buildings contain modern classrooms, laboratories, and machinery, and the various curricula are designed to encourage students to try out their imaginative ideas.

R.A.E. STUDENTS AND THE FUTURE

WHEN Mr. Arthur Woodburn, Parliamentary Secretary to M.A.P., presented prizes to students at the Royal Aircraft Establishment Technical College at Farnborough recently, he told them that British science had saved the world from Hitlerism and that the lessons of the past proved that nations which lagged only slightly behind in the development of weapons, tactics, strategy, and scientific thought found themselves outfought, outmanœuvred and defeated. Students at the R.A.E. Technical College were entering a great world of discovery and achievement, and the college was giving an example in the combination of general education with high technical qualifications. Clearly our young men and women —particularly those working on aeronautical development— were called upon to play a great part in this new epoch, and their future attainments could not only benefit their own country, but contribute in great measure to understanding between the nations.

Tracing the traditions of the R.A.E. back to H.M. Balloon Factory at Woolwich in 1878, Mr. Woodburn mentioned some examples of its recent contributions to aeronautics. These included wind tunnel tests at speeds up to 600 m.p.h. carried out since 1942 on models of all our modern high-speed aircraft, the use of tropic test chambers to produce various climatic conditions and so prevent corrosion of aircraft components, the development of V.H.F. radio communication, automatic pilots and cameras, and experiments in the use of liquid oxygen and nitrous oxide for producing temporary increase of power at high altitudes.

We were, he concluded, only on the threshold of discoveries difficult to appreciate, and when we remembered that the German rocket which bombarded London travelled through the air undamaged at 3,600 m.p.h., we realised that even the Gloster Meteor's record of 606 m.p.h. was the beginning and not the end of achievement.

TURBINE-JET PROPULSION

MANY readers have written in appreciation of the coloured supplement devoted to an explanation of gas turbine principles in FLIGHT of 21st February. Copies are still available as a separate four-page supplement, price 6d. post free, from FLIGHT offices.

Stress Without Strain

A Simplified Method of Airscrew Blade Stressing, with Special Reference to Wood or "Improved Wood" Blades

By ANTHONY A. FLETCHER, M.A. (Oxon.)

FIRST of all, I wish to acknowledge my vast debt to that brilliant epitome of experimental research, the de Havilland Report No. 83. At one sweep this invaluable treatise has cleared away the difficulties which, to all but the "experts," have hitherto encumbered airscrew design, and has made it possible for any or all to produce airscrews which, from the aerodynamic standpoint, will not only work, but work very well indeed.

But, alas, however beautiful and efficient an airscrew may be, it is of no use as a practical workaday article unless it is strong enough to withstand, without flying to pieces, the appalling number of "horses" that is now pumped into it as a matter of course.

The whole pith of D.H. Report No. 83 consists in carrying all questions of aerodynamic design back to a certain predetermined "Standard" airscrew, upon which the changes are rung, so to speak, by a succession of experimentally determined constants and coefficients, until the eventual outcome marries-up with the particular set of requirements.

It occurred to the writer, in one of those blinding flashes of the obvious to which even a mediocre intelligence is liable from time to time that perhaps a similar line of treatment might be usefully applied to elucidating and simplifying the Great Stress Problem. A start was, therefore, made by selecting a plan form of blade which was known from practical experience to be very satisfactory and sweet-running. This plan form is shown in Fig. 1, which gives the chord at any given section in terms of the greatest chord width. This occurs at 0.45 radius, and is known as section C-C. Note that Fig. 1 represents proportional chord widths only; in actual practice, of course, the blade is symmetrical in plan, or, if not quite symmetrical, disposed about a straight radial line passing through the centre of gravity of each section (the so-called "Locus of Centroids"). The same remark applies to the blade as viewed in side elevation.

The next point to be settled is the distribution of the load along the blade, because the actual stresses incurred in the airscrew depend upon how the load is distributed. Concerning this, there are many schools of thought, but for the purposes of this method it is assumed that the total air load varies along the blade as the integral of the radius squared times the width plotted against the radius.

This method of allowing for the effects of area is quite as accurate as any, and, it is believed, was first adopted by Hamilton Standard and then by de Havillands. The justification for its adoption lies in the fact that under static conditions—which nearly always impose the greatest loads upon an airscrew blade—the inner portions of the blade run at a coarser angle of attack, relative to the outer portions, than they do at high speed; of course, the aerofoil sections of all airscrews, whether V.P. or F.P., become thicker towards the root. By neglecting these factors we tend to calculate higher loads on the outer portions of the blade than actually occur; in other words, by adopting the system of load distribution (Fig. 2) we err, very decidedly, upon the safe side.

The next assumption to be made (heigh-ho, these assumptions!) is that the distribution of the load does not extend farther inboard than 0.2 of the airscrew radius. This seems entirely logical, as nowadays this inboard portion is nearly always covered up by a spinner or some similar "gubbins."

Here we are, then, with our load-distribution curve ready to hand; what is to be done with it? The answer is very simple. By means of a planimeter we integrate it graphically, and the result of so doing is seen in Fig. 3, which is the Shear Force Curve, expressed in proportional intensity of shear. To those who are not familiar with graphical integration, all it means is that we construct a new curve, the ordinates of which represent the total area, and the proportions of the total area, of the original curve. For example, in Fig. 3 the ordinate at the 0.2 section, which bears the value unity, represents the total area of Fig. 2; the ordinate of the 0.3 section in Fig. 3 represents the area of the curve in Fig. 2 from the 0.3 section to the tip, as a proportion of the whole, and so on, and so forth.

We now take our Shear Force Curve and, doing another spot of graphical integration on precisely similar lines, produce another curve (Fig. 4), which is the Curve of Bend-

"TONY" Fletcher is one of the old-timers in British aviation. He started with the Martinsyde firm at Brooklands in the early days, and his job, previous to his well-earned retirement, was that of chief designer to Hordern-Richmond Aircraft.

In submitting the article to the Editor, his covering letter took the following form :—

ACCEPT, I beg, dear C.M.P.,
this unpretentious jeu d'esprit;
a bid to simplify the mess
that seems to cumber airscrew stress.

It's not for highbrows and their pals,
who sport with double integrals
and solve, without the slightest fuss,
terrific sums in calculus.

Rather, 'tis hoped that it may be
of comfort to the P.B.D.,
enabling him to do his stuff
and make his windsticks strong enough.

So, should you feel inclined to smile
and crab its literary (?) style,
just glance again at stanza two—
it is not meant for such as you!

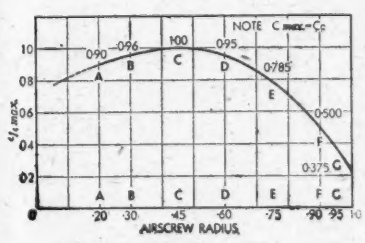


Fig. 1. C : C_{max} plotted against radius.

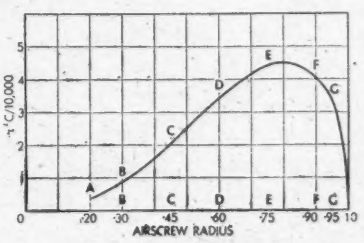


Fig. 2. Load-distribution diagram.

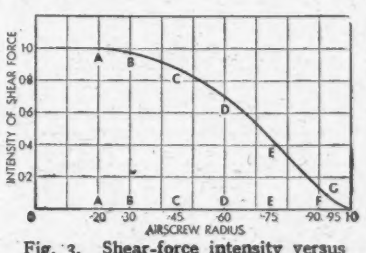


Fig. 3. Shear-force intensity versus radius.

STRESS WITHOUT STRAIN

ing Moments, or, for short, the B.M. Curve, in which, just as in the case of the Shear Force (S.F.) Curve, the values of the bending moments at the various sections along the blade are expressed as proportions of the Greatest Bending Moment (or B.M. max.).

Yes, but what is the value of the B.M. max? Look back for one moment to Fig. 3. If the total load on the blade be imagined as concentrated into one huge lump and balanced by some miraculous agency on the extreme tip, it is clear that then B.M. max. = W. × L, or the weight times the length of the arm. For this system of loading, the Shear Force Diagram would be a rectangle, and the intensity of the shear constant throughout the length. So that, if drawn to the same scale as Fig. 3, the area of the S.F. rectangle would be 8in. × 5in., or 40 sq. in. But the load is *not* thus concentrated, and the area of the S.F. Diagram is not 40 sq. in., but only 24.72 sq. in., which is but 0.618 of the rectangular area. Hence the Biggest Bending Moment is discovered to be 0.618 WL, where W is the total air load on the blade and L is 0.8 of the airscrew radius, or full blade length from the axis of rotation to the extreme tip. A few moments' agitation of the slide rule, and we can write down from Fig. 4 or 5 the value of the B.M. at all or any section along the blade. How simple! But even this, as will be explained presently, will not be required of us.

The Centrifugal Force Problem

So we have now quite simply and easily disposed of The Great Bending Moment Question; it now remains to find an equally quick and easy way of dealing with the Centrifugal Force Problem. Here goes, then.

As a step towards the solution, a delightful but wholly impracticable airscrew blade was imagined with a radius of 100in., a maximum chord width of 10in., and, just to make matters as easy as possible, the r.p.m. were settled at 1,000, and the weight of the material from which the airscrew is supposed to be made at 100 lb. per cubic foot. The blade, needless to say, conforms to the "Standard" plan-form as given in Fig. 1.

Now nobody, especially in these days when the call is all for economy and yet more economy, wants to waste good and expensive material. So it is all to the gain of ourselves (and also to that of the aircraft and engine!) that our airscrew scantlings should be the smallest permissible, as in this case we save both cost and weight. To achieve this laudable ambition, we can make good use of the stresses induced by Centrifugal Force, since they are what the mathematicians call "algebraically additive" to the Bending Moment Stresses; that is, they act as relief to the compressive stresses induced by bending whilst at the same time, of course, adding to the tensile stresses.

We must now hark back for a while to our bending moments. Let us suppose that the total air load on the blade is 1,000 lb., and that the hypothetical material of which our airscrew is made has a maximum permissible working stress of 10,000 lb. per sq. in. in compression, being considerably stronger in tension. We may, if we like, think of it as being made of one of the new "improved woods," in which case our imaginary values are not wholly fantastic. Now we can go ahead. First of all, neglecting centrifugal force entirely, we can find the thicknesses at the various stations necessary to resist bending, taking the compression modulus of section to be that sanctioned by the Air Ministry in A.P.970, viz., Zc = 0.08 Ct. squared, where C is the chord of the section under consideration, and t is the thickness. This gives us results as under:

Section	per cent. radius	C (in.)	B.M. lb./in.	Zc required	$t=\left(\frac{Zc}{.08C}\right)^{\frac{1}{2}}$ (in.)
A–A	20	9·00	49,440	4·944	2·620
B–B	30	9·60	39,700	3·970	2·274
C–C	45	10·00	25,360	2·536	1·780
D–D	60	9·50	13,300	1·330	1·323
E–E	75	7·85	4,760	0·476	0·8706
F–F	90	5·00	559	0·0559	0·3738
G–G	95	3·75	99	0·0099	0·1816

Now we have something to get on with, but just a reminder in passing: So far as *centrifugal stress* is concerned, it makes no difference whatsoever whether we take, in our calculations, the areas of the various sections as being simply C × t, or 0.7 C × t, or any other *constant* value of C × t; of course, it makes a vast difference to the *total centrifugal pull* exerted by the blade in its rotation, but we are not so much concerned with that here, and so, for ease of calculation, we can take the area of each section as being simply C × t. I mention this point here because, although it seems rather silly to do so, I have found that occasionally there is some little difficulty in grasping it.

We must now find $\frac{dCF}{dr}$ or, in other words, the rate of change of centrifugal loading in lb. per inch run of blade, plotted against radius. This, of course, will equal

$$\frac{4\times\pi^2\times(1{,}000)^2\times 100\times R\times A^*}{32.2\times 12\times 1{,}728.}$$

The first part of this, viz.:

$$\frac{4\times\pi^2\times(1{,}000)^2\times 100}{32.2\times 12\times 1{,}728}$$

boils down to 1.643.

Hence we get:

Section	Radius (in.)	A sq. in. = C × t	$\frac{dCF}{dr}$ = 1·643 × r × A
A–A	20	9·0 × 2·62	774·5
B–B	30	9·6 × 2·274	1075
C–C	45	10·0 × 1·780	1315
D–D	60	9·50 × 1·323	1238
E–E	75	7·85 × 0·8706	842
F–F	90	5·0 × 0·3738	276
G–G	95	3·75 × 0·1816	106

We now take these values of $\frac{dCF}{dr}$ and set them up to some convenient scale as ordinates. (See Fig. 6.) In the original graph I took 1in. vertical as being equivalent to 250 lb. per inch run, giving us a nice compact diagram well within the capacity of an ordinary small planimeter, but, of course, it is published here on a reduced scale. This,

* Remember that we are working in inch/lb. units throughout. This accounts for the presence of 12 and 1728 in the denominator—12 to bring "g" (or 32·2) to inches per sec. per sec., and 1728 because there are 1728 cubic inches to the cubic foot, and "100" in the numerator is the weight of our imaginary material in lb. per cubic foot.

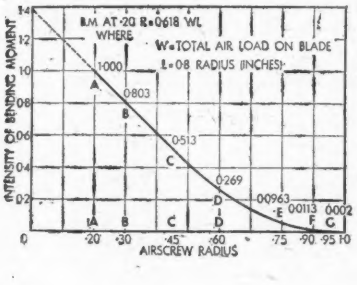


Fig 4. Bending moment plotted against radius.

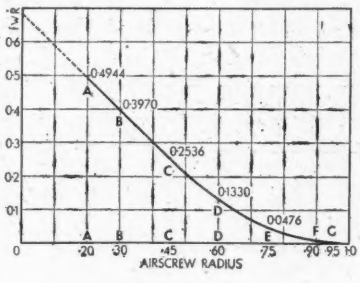


Fig. 5. Chart of fWR vs. radius.

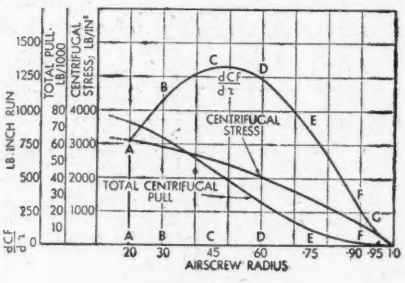


Fig. 6. Centrifugal force and stress (first stage).

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designed expressedly for and fitted exclusively to the wonderful "Bristol" Hercules sleeve valve engine

THE "Bristol" FREIGHTER

Powered by Bristol Hercules engines

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"BRISTOL" FREIGHTER

Another "Bristol"... another opportunity for **SKF** bearings to demonstrate their efficiency and dependability in cargo and passenger air transportation.

THE SKEFKO BALL BEARING CO., LTD. LUTON

The BRITISH MANUFACTURERS OF THE WORLD RENOWNED SKF BEARINGS

The **SKF** *Double Row Self-Aligning Roller Bearing as fitted on the Main Crankshaft and Sleeve Cranks mechanism of the power units of the "Bristol" Freighter. This bearing is designed to withstand the heaviest radial and thrust loadings, and its self-aligning construction distributes the load evenly on each set of rollers, thus ensuring the greatest possible capacity in a given space. The ideal unit for long life under severe conditions.*

STRESS WITHOUT STRAIN

it will be noticed, is just another example of now familiar graphical integration.

Now let us make up a table as under, calling, for the sake of brevity, centrifugal pull "P" and centrifugal stress "Sp."

Section	Diagram Area (in.²) = DA	P (lb.) = 2,500 DA	Sp. (lb. in²) = P / Area of Section
A–A	29·06	72,650	3080
B–B	25·40	63,500	2910
C–C	18·00	45,000	2528
D–D	10·20	25,500	2030
E–E	3·80	9,500	1390
F–F	0·48	1,200	642
G–G	0·10	250	366

Let us now remember what has been said before about centrifugal stress being "algebraically additive" to bending stress, and acting as relief to compressive stresses caused by bend.

With this in mind we can construct another table giving us new values of "Zc" and consequently "t."

Section	B.M. lb./in.	New Permissible Stress (lb./in.²)	New "Zc"	New "t"
A–A	49,440	10,000 + 3,080	3·781	2·292
B–B	39,700	10,000 + 2,910	3·075	2·001
C–C	25,360	10,000 + 2,528	2·024	1·591
D–D	13,300	10,000 + 2,030	1·106	1·206
E–E	4,760	10,000 + 1,390	0·418	0·8157
F–F	559	10,000 + 624	0·0525	0·3623
G–G	99	10,000 + 366	0·00954	0·1783

We see at once that the inclusion of the centrifugal stress has had a very pronounced effect upon the thicknesses. Suppose then that we were to take the new values of the $\frac{dCF}{dr}$, which, of course, will be smaller than our original values, owing to the lesser thickness of the sections, and repeat the process two or three times. What shall we find? We shall find that after a while one or two of the sections — the first to be affected are those towards the extreme tip—begin to get thicker instead of thinner, showing that it is no good carrying the process any further. When all the sections exhibit this peculiarity it is time to call a halt, for we have now reached the point where, *under the particular set of conditions postulated to begin with*, the ultimate compressive stress at every section, i.e., the compressive stress induced by bending less the stress due to centrifugal force, is 10,000 lb. per square inch.

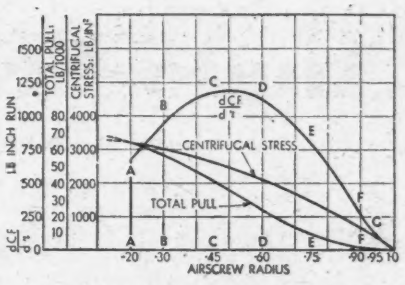


Fig. 7. Centrifugal force and stress (final stage).

It would be of no particular advantage to give the detailed working-out of each successive stage, as it follows lines precisely similar to the first. So we will just make a table giving the final dimensions and stresses, as thus arrived at, for our "standard" airscrew.

Section	C(in.)	t(in.)	Zc	B.M. (lb./in.)	B.M. Zc (lb./in.²)	P (lb.)	Sp (lb./in.²)	Ultimate Compressive Stress (lb./in.²)
A–A	9·00	2·279	3·741	49,440	13,220	66,000	3,220	10,000
B–B	9·60	1·993	3·052	39,700	13,010	57,625	3,010	10,000
C–C	10·00	1·585	2·010	25,360	12,617	41,500	2,617	10,000
D–D	9·50	1·203	1·100	13,300	12,100	24,500	2,100	10,000
E–E	7·85	0·8136	0·4158	4,760	11,450	9,262	1,450	10,000
F–F	5·00	0·3623	0·05252	559	10,660	1,200	660	10,000
G–G	3·75	0·1783	0·009555	99	10,374	250	374	10,000

These figures are accurate within the limits of a four-figure log. table, or 10in. slide rule.

(To be continued next week)

BERLIN AIR SAFETY CENTRE

International Flying Control Section for German Capital

BRITISH, American, French and Russian air controllers, sitting in a small, map-covered operations room in the heart of Berlin, are now controlling all passenger-carrying aircraft flying to and from the capital. This small room is the Berlin Air Safety Centre, which came into operation on Monday, February 25th.

The controllers sit in a row at desks and maintain contact with their respective airfields by means of ten-line switchboards. In the case of the British controller, seven of these lines connect with the meteorological, operations and flying control departments at Gatow airfield. Other British facilities include a teleprinter service to Gatow, and a direct telephone link to B.A.F.O. operations. The system enables the British controller to get into immediate touch with Gatow whenever he wishes, and to obtain, through the medium of the R.A.F. operations room at B.A.F.O., Buckeburg, a cross-Channel call to England. He is thus able to obtain weather reports and flight information direct from Headquarters, Transport Command, and pass it on to his co-controllers on the American, French and Russian desks. They in turn are able to exchange information on flying conditions, and on aircraft in flight to and from keypoints as far away as Paris, Frankfurt, Munich, Warsaw and Moscow.

When any passenger-aircraft belonging to one of the four nations is within 75 miles of Berlin, the pilot calls up the Berlin Safety Control Centre to ask for instructions. After consulting the maps and plots, the appropriate controller instructs the aircraft to fly a certain course at a given altitude and gives it full landing instructions. During bad-weather flying these safety precautions will do much to preclude any risk of collisions, and will simplify the task of diverting aircraft to alternative airfields when necessary.

Take-off procedure is similar. Before a passenger aircraft is permitted to take off from any of the Berlin airfields, it must first obtain permission from the Safety Centre, which, again, will issue directions for course and altitude and will give meteorological and other information along the route of flight.

The American controller is in direct contact with Templehof airfield which, although it is primarily under American control, is at present being shared with the French until another airfield, which is under construction for the latter in the French section of Berlin, is ready. The Russians use Adlershof airfield exclusively.

The U.S. system of flight control has been adopted by the Berlin Air Safety Control Centre, and flight progress boards, as used for control of civil aircraft, are employed.

The British component of the all-R.A.F. control staff is led by Sqn. Ldr. R. Aldous, who is Senior Flying Controller, and his staff comprises seven flying controllers, two interpreters and twenty other ranks.

JUST AS SAFE BY AIR

FLIGHT learns that the Sun Insurance Office, Ltd., is extending its personal accident policies to include flying by recognised air lines anywhere in the world without any addition to the normal rates of premium charged hitherto. This development, following on the report in *Flight*, Feb. 21st, of greatly reduced cover rates on four domestic airlines, is another welcome sign that air travel is rapidly being accepted as a normal means of transport with no more inherent risk of accident than travel by rail or sea.

It also shows an appreciation of the essential difference between airline operation and Service aviation.

CIVIL AVIATION

Anglo-French Agreement

Joint Standing Committee to Co-ordinate Mutual Air Services : Route Capacities to be Equally Shared

AT the Foreign Office in London last Thursday, February 28th, representatives of the British and the French Governments placed their signatures to an agreement which provides for the progressive expansion of civil air services between the two countries, and for the interchange of facilities on air routes which cross British or French territories throughout the world. As announced in *Flight* last week the agreement was reached after only a week of negotiations, and it takes effect immediately.

The rapid and satisfactory negotiations were made possible primarily by the fact that the French and British Governments both share the same basic ideas on civil aviation, namely the desire to organize regular international air services in a reliable and orderly manner. This was stressed in a statement last Thursday by Mr. Ivor Thomas, Parliamentary Secretary to the Minister of Civil Aviation, who led the British delegation which went to France to negotiate this agreement. He paid a warm tribute to the French delegates, particularly M. Jules Moch, the French Minister of Public Works and Transport, who had shown the greatest understanding and co-operation throughout the negotiations.

The agreement supersedes all previous Anglo-French air transport agreements, notably those dated August 5th, 1929, and August 12th, 1937. It follows closely the standard form of air transport agreement which was drawn up at the Chicago Conference in 1944, and this, no doubt, facilitated its early conclusion

Features of the Agreement

Most of the essential features of the new agreement are parallel with those included in the very recent Bermuda agreement with America; such points as the granting of mutual rights for through flights, for non-traffic landings, and for the disembarking and embarking of international traffic under certain agreed conditions, and machinery for joint agreement on rates, are included. In addition, the fundamental principle that the capacity of all airline services operating to, or through, their territories shall bear a close relationship to traffic demands, has been affirmed by both Governments.

Perhaps the most notable step forward, however, is the institution of a standing joint committee consisting of eight members, four from each country. Of each four, two will be representatives of the airlines, and the other two of the aeronautical authority of the country concerned. The committee is to meet alternately in Paris and London, with the object of co-ordinating mutual air services, and submitting proposals, when necessary, for modifications affecting any of the items covered in the annex to the agreement, such as rates or traffic schedules.

Mr. Thomas said that fares would be fixed at reasonable levels, and that, in particular, due regard would be paid to economical operation, reasonable profit, and to the characteristics expected from each service in such matters as speed and comfort. The annex to the agreement provides that the recommendations of the International Air Transport Association shall be taken into account when fixing rates, but when their recommendations are not available, any questions affecting rates for route stages which are common to both countries can be decided mutually by the airlines themselves after consultation, if necessary, with the airlines of any third parties operating over the same route. All such rates will require the approval of the two Governments, but nevertheless this arrangement seems to allow the airlines concerned considerable latitude in rate fixing.

The subject of "fifth freedom" traffic has been dealt with thoroughly and, in the case of international services, the principles adopted are similar to those in the Anglo-American agreement, namely, that the capacity of these services will meet, primarily, only the demands for transport between country of origin and country of destination.

U.K.–France Services

In the case of services between the U.K. and "Metropolitan" France, however, it is a much easier matter to forecast with some accuracy the likely demand, and so, at the outset, the aeronautical authorities of the two countries are to agree on the capacity of such routes. The routes affected are those between London or provincial towns in U.K., and Paris, or provincial towns in France, including also points in Algeria, Corsica, Morocco and Tunisia. Subsequently, the airlines themselves can adjust frequencies either temporarily or permanently in order to meet fluctuations in traffic, but the capacity will always be divided equally between the British and French airlines concerned. Incidentally, if one country is granted the right to operate one of these routes, the right of the other country to participate in that route is automatic.

Mr. Thomas intimated that a pooling of services between the airlines of the two countries has already begun. A start was made with the London-Paris route and the "heads" of an agreement have already been reached. In due course, the frequency of the London-Paris service is to be speeded up, and it is expected that, eventually, each country will be running at least a half-hourly service on this route. For the time being, travellers from provincial towns in the U.K. who wish to visit Paris will need to travel via Northolt, and in the very near future the French airlines will be admitted to this airfield. In due course, however, additional services will operate direct from the provincial towns of one country to both the capital and the provincial towns of the other. Thus, passengers will be able to fly direct from, say, Newcastle to the Riviera. Mr. Thomas said that, although fares to Paris were high at the moment, it was hoped to bring them down soon.

Approved Routes

Attached to the annex to the agreement, is a comprehensive schedule of routes which are approved for mutual operation by the U.K. and France. It is world-wide in its scope, and is drawn up in similar manner to the schedule of approved routes in the Bermuda agreement, as described in last week's issue of *Flight*. The Anglo-French agreement is, however, more specific, in that the routes across one country's territory, over which aircraft of the other country may fly, are divided clearly into two classes. The first class enumerates routes which traverse the other country's territory either with or without *non-traffic* stops (e.g. from U.K., across France, to Malta, Egypt, Iraq and India). The second class sets out routes which have a destination in the other country's territory, but which may continue to points beyond, thus permitting "fill-up" traffic (e.g., from U.K. to a destination in France, but continuing, if desired, to, say, Naples, Athens and Istanbul).

M. Jules Moch, who was visiting this country in order to sign the agreement on behalf of the French Government, reaffirmed the importance of the standing joint committee, and declared that it was the first time that an international organisation had been set up to co-ordinate air services between two nations in such detail.

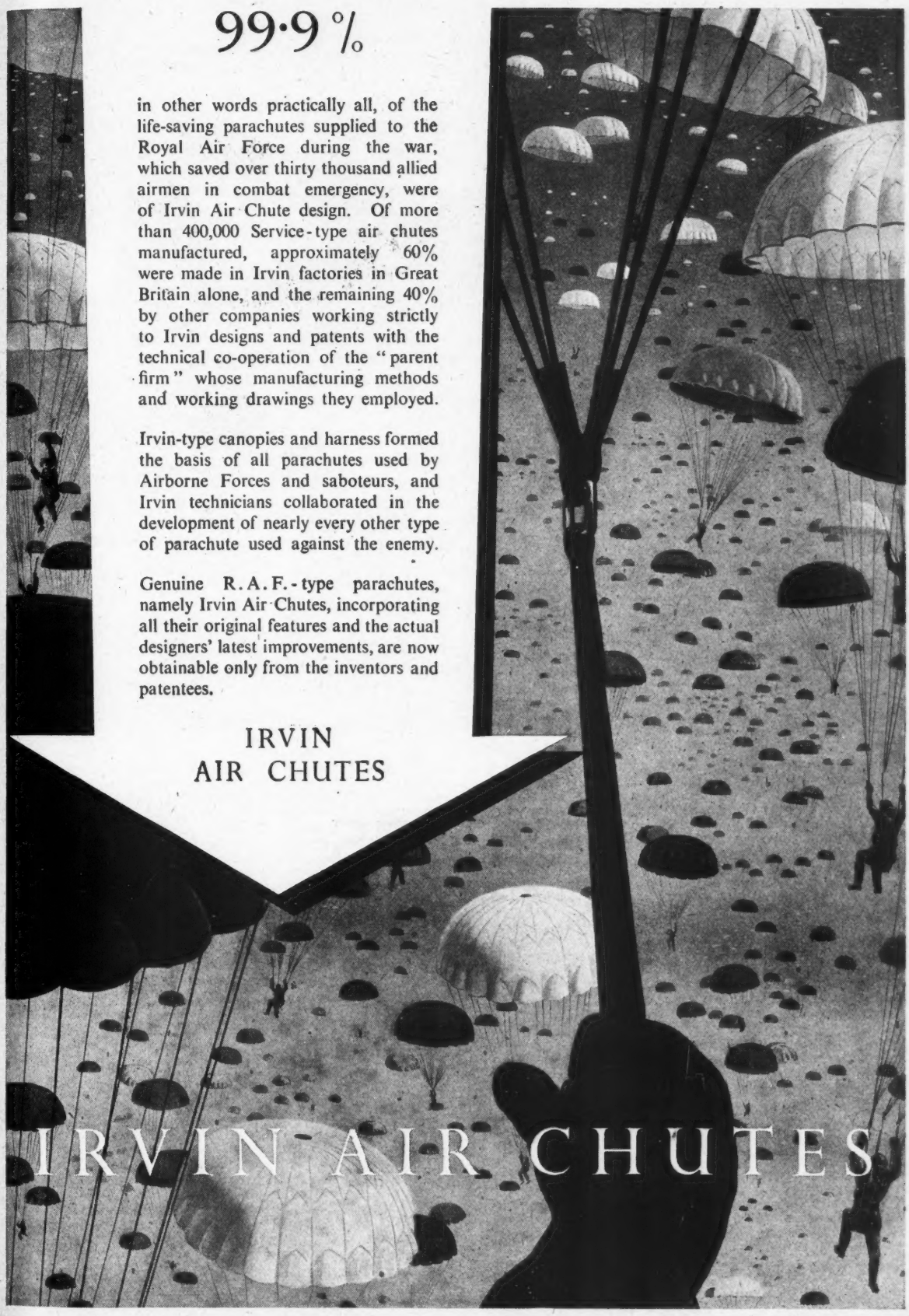
99·9 %

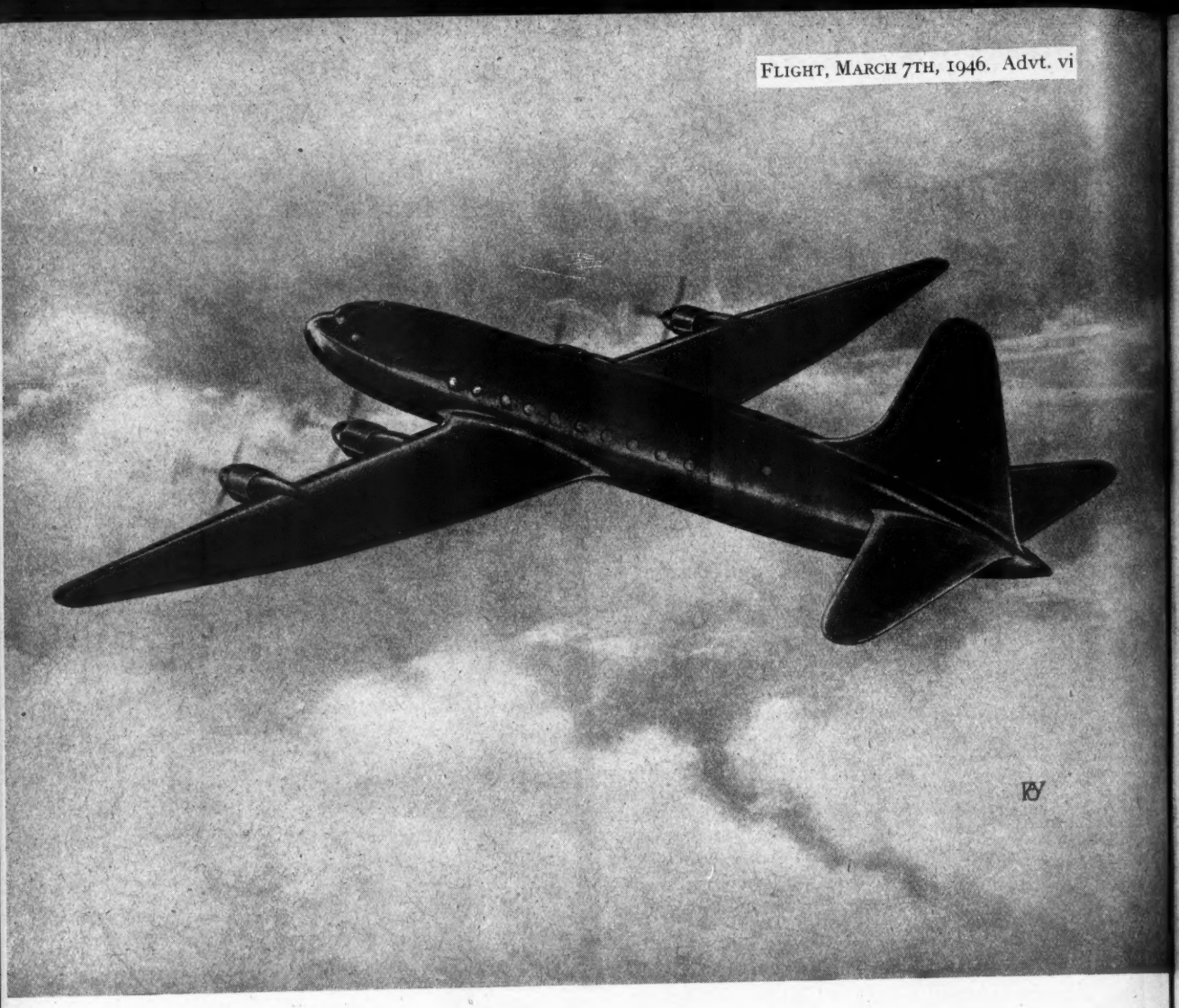
in other words practically all, of the life-saving parachutes supplied to the Royal Air Force during the war, which saved over thirty thousand allied airmen in combat emergency, were of Irvin Air Chute design. Of more than 400,000 Service-type air chutes manufactured, approximately 60% were made in Irvin factories in Great Britain alone, and the remaining 40% by other companies working strictly to Irvin designs and patents with the technical co-operation of the "parent firm" whose manufacturing methods and working drawings they employed.

Irvin-type canopies and harness formed the basis of all parachutes used by Airborne Forces and saboteurs, and Irvin technicians collaborated in the development of nearly every other type of parachute used against the enemy.

Genuine R.A.F.-type parachutes, namely Irvin Air Chutes, incorporating all their original features and the actual designers' latest improvements, are now obtainable only from the inventors and patentees.

IRVIN
AIR CHUTES





HERMES

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CIVIL AVIATION NEWS

OCEAN-GOING DINER: A comfortable dining lounge is a feature of the "Dodero" Sunderland *Brasil*, which is designed to carry 21 passengers over the South Atlantic between Argentina and Europe.

SCANDINAVIAN AIRLINES

AN organisation to be called Scandinavian Air Lines is to be formed jointly by the Danish, Swedish and Norwegian airline companies. Skymasters will be used for a service three times a week in each direction between Copenhagen, Stockholm, Oslo and New York, beginning next May.

In planning trans-Atlantic traffic one of the problems which has to be solved is that of suitable airfields, for whilst Denmark and Norway possess airfields capable of taking large and heavily laden aircraft, Sweden has no such airfield at present.

P.I.C.A.O. APPOINTMENTS

THE latest series of senior appointments to the Secretariat of the P.I.C.A.O. includes three United Kingdom representatives. Group Capt. Frank Entwistle has been appointed chief of the organisation's Meteorological Section. He joined the Air Ministry Meteorological Service in 1919 and since 1923 has held a number of important meteorological posts, including that of Assistant Director of the Meteorological Office (Overseas) since 1939.

Mr. Charles Clark is to be Chief of the Personnel Licensing Section. He joined the R.A.F. in 1925, and after serving an apprenticeship at Halton was trained as a pilot. Subsequently, he joined the Department of Civil Aviation and was placed in charge of civil pilots' and navigators' examinations. Later, he became Senior Examination Officer to the Department. The third appointment is that of Miss J. M. Wollaston, formerly Mr. J. B. Priestley's secretary, as chief of the Registry Section. Miss Wollaston served with the W.A.A.F. during the war, and reached Squadron Officer rank.

PERISHABLES BY AIR

AIR transportation of perishable goods forms the subject matter for a well-produced survey prepared in America jointly by the United States Department of Agriculture and the Edward S. Evans Transportation Research of Washington. "Florida's Production of Agricultural Perishables in Relation to the Development of Air Freight" is the somewhat unwieldy title of the survey, which envisages the building up of a market for tropical and subtropical crops and flowers from Florida in the more northerly states entirely as a result of rapid carriage by air. Experiments already carried out with strawberries, tomatoes and lettuces have shown that, although air-transported produce must be sold at "premium prices" and must, therefore, be of superior quality to that carried by surface transport, there are nevertheless off-setting factors to be considered, such as the use of lighter containers, the exclusion of ice, and the elimination of some packing costs.

The survey illustrates, once again, America's determination to throw open air transport to every class of passenger and freight, and to make air travel the universally accepted method of transportation.

SHORT ECONOMY

THE Short Sunderland *Brasil* which was delivered to the Dodero Company of Buenos Aires last month undertook a flight from South to North America between February 15th and 18th, in which it achieved the excellent fuel consumption of well over one mile per gallon. This figure was obtained not only as an average consumption for the entire trip, but also as an individual consumption figure on each leg of the journey. Incidentally, a similar figure was obtained from the *Argentina* on its initial "delivery" flight from Poole to Buenos Aires.

The recent flight was from Montevideo, via Rio, Natal, Trinidad and Bermuda to Baltimore, a total flying distance of over 7,000 statute miles. The total fuel used was 6,415 gallons, and the total flying time was 44 hr 21 min.

The fourth "Dodero" Sunderland *Inglaterra*, a sister boat to the *Brasil*, has just been delivered to South America. It was flown out by Air Commodore Powell of British Aviation Services, Ltd.

CABIN COOLING

WITH all the other manufacturers of fast, pressurised transport aircraft, Lockheeds have put in a good deal of experimental work on the various problems involved in keeping the passenger compartment at a reasonably constant temperature. Since our own Empire services pass through extremes of temperature and humidity as great as any experienced on routes operated by American companies, the final refrigerating installation in the Constellation may be interesting to designers over here.

After several attempts to obtain refrigeration both by the vapour-compression cycle and the "dry ice" methods, both of which are commonly used for industrial and domestic cooling systems, the thermodynamic engineers at Lockheeds finally devised an air-expansion turbine refrigeration-unit weighing only 115 lb. At this weight the unit produces the same result as any more standard device weighing as much as 5,000 lb.

With this unit the passenger cabin of the Constellation is kept within the passenger comfort zone of 75 deg. even in conditions when the ground temperatures are as high as 100 deg. Apart from the direct effects of sun heat while on the ground, the modern aircraft interior is still further heated by the pressurising system and by air friction which, at 300 m.p.h., may produce a rise of as much as 15 to 20 deg. Needless to say, the Constellation cooling system is part and parcel of the pressurisation equipment.

Incidentally, the C.A.B. granted an approved type certificate for the Constellation early in December. The gross landing weight was established at 75,000 lb., though one test landing was made at the high figure of 82,000 lb. The all-up take-off weight was 90,000 lb., and at this figure a three-engined take-off, clearing a 50ft. screen, was made in a matter of 1,270 yards. The landing figure over the same screen was 800 yards.

CIVIL AVIATION NEWS

D.H. EXPERT FOR CANADA

ONE of de Havilland's most experienced aircraft engineers, Mr. Frederick C. Plumb, has just arrived in Canada from England to take up an important post in the Canadian de Havilland organization. He travelled with Mr. W. D. Hunter, engineering director of the Canadian company, who has just returned from a visit to the parent company. Mr. Plumb, although a young man, has over 20 years' experience in the de Havilland factories, having joined the firm in November, 1925. He built the first Tiger Moth and every subsequent de Havilland prototype up to the Dove in 1945.

LAST TRANSATLANTIC BOEING

THE B.O.A.C. Boeing flying boat which is due to leave Poole to-day for Baltimore, was the last of these boats to undertake the Atlantic crossing. This particular service is being discontinued altogether for the time being until a regular direct transatlantic service can be put into operation using the five Constellations recently ordered from America. The new service, however, is not likely to be in operation before midsummer, when a daily flight in each direction is contemplated. The fact that the U.S. Army's airfield at Kindley Field, Bermuda, has now been made available for commercial flying has paved the way for a transatlantic service by landplanes over this route.

PARIS AIR TERMINUS

THE Gare des Invalides, which is no longer used as a railway station, has been acquired by Air France who are converting it into an air terminal building for Paris. It is to be opened in May, and is claimed to be the largest air terminus of its kind in the world. It will be used not only by Air France, but also by all airlines serving Paris, and it is anticipated that, by next year, 8,000 passengers will pass through this terminus each day.

Atlantic and other long-distance flights will terminate at Orly airfield, and local air traffic will use Le Bourget. The Gare des Invalides is conveniently situated on main boulevards within easy reach of both airfields. The building is on two levels, and is being provided with waiting rooms, restaurant, ticket offices and essential shops. The railway lines have been removed from the lower level to provide a park for motor coaches, cars and taxis.

LANCASHIRE AFFAIRS

ONE of the airfields which are to be taken over by the Ministry of Civil Aviation is that at Squire's Gate, between Blackpool and Lytnam-St. Annes. Squire's Gate, which has for the last two years been a bone of contention between the boroughs concerned, has been very considerably developed during the war and could certainly not be handed back to the municipality without very considerable financial readjustments. Two years ago a suggestion appeared that the airfield might be developed for transatlantic operations—one of many such suggestions for sites up and down the west coast.

The first civil air service flight from Squire's Gate took place last Saturday, when two D.H. Rapides flew the Mayor and Mayoress of Blackpool and their party to Ronaldsway in the Isle of Man, to attend the 50th anniversary celebration of the incorporation of Douglas as a borough. The two aircraft are owned by the Lancashire Aircraft Corporation which is operating an air charter service from Squire's Gate, and also from Salmesbury, the Preston and Blackburn airfield.

LORDS' DEBATE

THERE was a long debate in the House of Lords on February 28th, on the Government's civil aviation policy Lord Balfour of Inchrye opened the debate, and freely criticised everything about civil aviation policy, saying that in every direction in which he looked, he found that we were really achieving nothing at the moment. Lord Sherwood, Viscount Swinton, Lord Rochdale and Lord Sempill also took part in the debate. Viscount Addison replied on behalf of Lord Winster, who was in Australia, but he had very little to add to the various points which have already been made from time to time on the subject of civil aviation by other Government speakers.

R.A.F. FLYING CLUB REVIVAL

AS already forecast in *Flight* of November 22nd, 1945, the Royal Air Force Flying Club will be restarting at Panshanger, near Hertford, on April 1st. Two D.H. Moth Minors have been bought; the flying rate will be as low as £2 per aircraft/hour. Additional aircraft may be acquired in the near future.

Membership is available to past and present members of the R.A.F., R.A.F.V.R., A.A.F., Dominion Air Forces, Royal Navy and Army. The minimum flying qualifications in all cases is 250 hours as first pilot. The annual subscription is £5 for full membership and £2 10s. for associate membership, and application forms may be obtained from the Hon. Secretary, R.A.F. Flying Club, Panshanger Airfield, Hertford. If the response is large enough, branches may be opened in other parts of the country. The Chief of the Air Staff, Marshal of the Royal Air Force Lord Tedder, G.C.B., has accepted the presidency of the club.

IRISH AIR VENTURE

A NEW company sponsored jointly by Aer Rianta Tta., who are responsible for implementing Eire Government civil aviation policy, and by Miles Aircraft Ltd., of Reading, is to be established at Dublin Airport in order to undertake the repair and maintenance of aircraft engines and equipment. The company will have an authorised capital of £240,000 and will be known as Aeroint Tta.

In due course, the company hopes to undertake the overhaul of engines and aircraft used by the Irish Army Air Corps and by Aer Lingus, the Irish airline company. Ultimately, it will establish air taxis and charter services, using aircraft capable of being landed on small airfields, and also assemble and manufacture aircraft and ancillary equipment. The chairman of the company is Mr. J. J. O'Leary, a director of Aer Lingus. The other directors are Mr. J. P. O'Brien (Aer Lingus), Mr. D. Herlihy (Assistant Secretary to the Eire Department of Industry and Commerce), Mr. F. G. Miles and Mr. C. O. Powis.

SCOTTISH DISSENSION

APPEALS from Scottish peers for the formation of a Scottish public utility corporation to own, operate, and develop Prestwick airport, and for a similar corporation to operate Scottish airlines, failed to move Lord Winster in the House of Lords recently. The Minister for Civil Aviation, replying to the debate, said that such proposals were contrary to the declared policy of the Government and were, therefore, unacceptable. The Scottish airlines should be operated within the British European Airways Corporation, but he was considering the possibility of forming a Scottish Airways Division, as a part of the B.E.A.C., and also of setting up a Scottish Advisory Committee to advise that corporation.

A few days later, Captain E. E. Fresson, Director of Scottish Airways, speaking at Kirkwall, said that the formation of a Scottish utility corporation was, in his view, undesirable. He pointed out that to operate air services economically, a pool organisation for the supply of aircraft, engines, and spares and for their overhaul was necessary, and a separate corporation would involve duplication of these services. This would be reflected in higher fares to the public.

Capt. Fresson was in favour of a Scottish operating board to control Scottish services and to work in close co-operation with British European Airways rather than have a Board sitting in London assisted by a Scottish advisory committee. He considered that air fares on a par with the cost of first class rail travel could be reached, but added that he was not so optimistic as to think that air travel could compete with third class rail travel over the short routes of Britain.

LUTON FLYING CLUB REOPENS

FIRST of the London area clubs to re-open, Luton Flying Club is also the first of the proposed group of Hunting Flying Clubs Ltd. Luton is fortunate in having a conveniently-placed airport which has been considerably developed during the war. Before performing the opening ceremony, last Saturday, March 2nd, the Mayor, Councillor W. G. Roberts, stressed Luton's determination to take advantage of air transport in the future, and left no doubt that both he and the Town Clerk, Mr. W. A. Robinson, who was also present, were thoroughly air-minded.

Between frequent snowstorms the first pupil was taken up on the first instructional flight, and one or two other aircraft added to the flying interest with short flying demonstrations. At present the Luton Club has two Tiger Moths and two more will be ready very shortly. These will be followed by two Proctors and later it is hoped by Austers.

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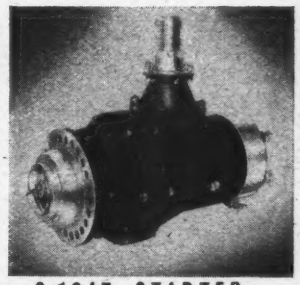

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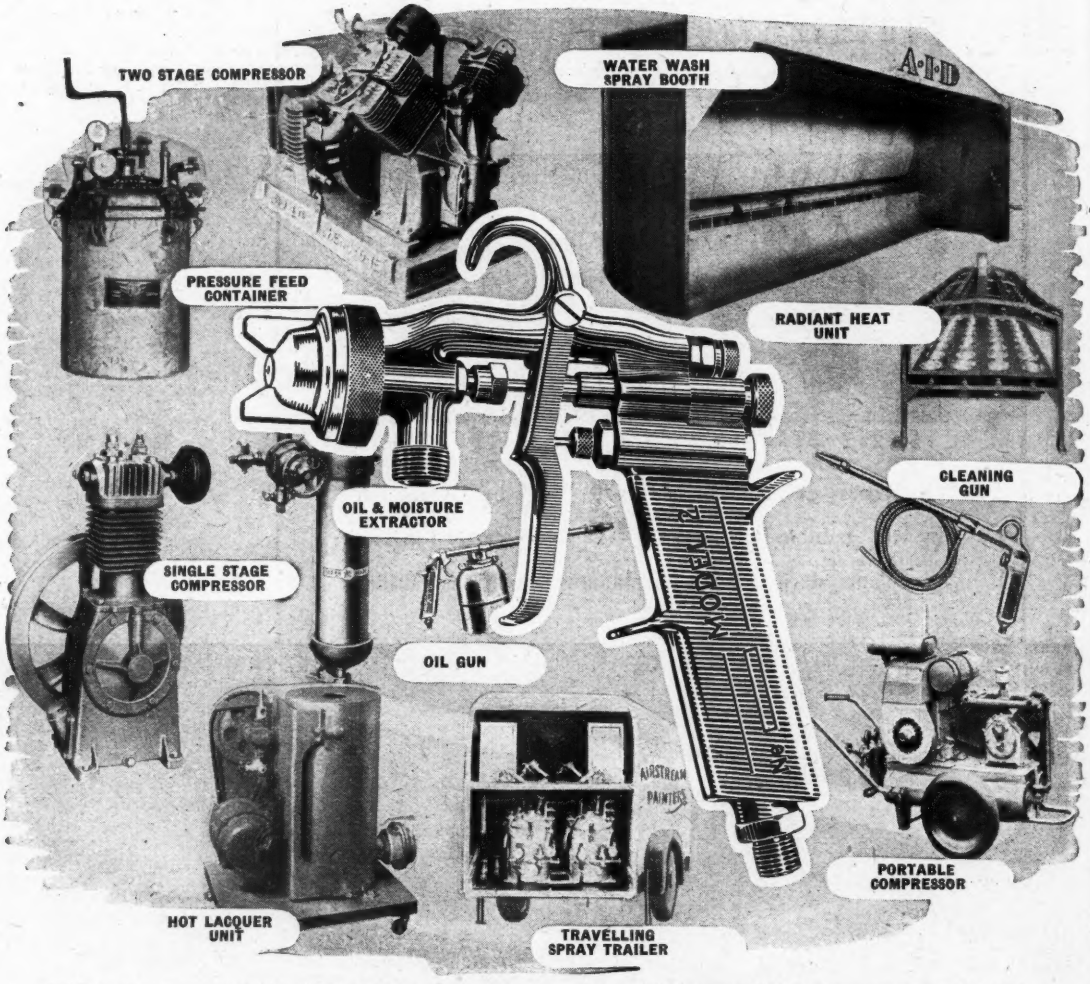

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Scientific A 12A

Radio and Civil Aviation

LECTURE BY
SIR ROBERT WATSON-WATT

Aids to Schedule-keeping : Safe Reduction of Factors of Safety : Additional Radio Preferable to Additional Fuel

AT the Institute of Civil Engineers, before members of the R.Ae.S. and guests from among the delegates to the International Conference on Radio and Radar, Sir Robert Watson-Watt, C.B., LL.D., F.R.S., F.R.Ae.S., on February 28th, delivered his lecture on the Application of Radio to Civil Aviation.

Sir Robert opened his very interesting address by stressing that his notes were not an official communication, but a strictly personal restatement of views formed in the course of official work, but based on facts and statements available to all. They were directed towards soliciting the views of the aircraft operator on his needs, of the aircraft designer on the aerodynamic and economic obstacles, and of the ground provisioning authority on the administrative, organisational, and economic factors affecting the choice of system.

The purpose of radio aids to air transport (the word radio is used to include radar) was to assist in the transport of the maximum payload in the minimum time at the minimum attainable cost by air services operating at the highest attainable standards of regularity, punctuality, safety and comfort. The pre-war air transport systems assured safety only by serious sacrifices in regularity and punctuality. With the high traffic densities which alone can assure and mark the success of post-war air transport, the whole structure of the traffic pattern at major airports will be dislocated by any failures to fly accurately on pre-arranged schedules no less familiar to the user, and no less reliable than the pre-war railway timetable. This accuracy in timing must be assured by the corresponding elimination of the need for diversions.

The lecturer said that the development of the argument was based on another postulate which is seldom contradicted but often forgotten. That is, that the ultimate responsibility, and ultimately the whole responsibility, for the same punctual execution of a scheduled flight rests on the master of the aircraft. A system of radio aids which is not consciously directed to convey to the master all the information and advice which he requires as a basis for his aided but ultimately unfettered judgment is a bad system. It was most important that this fact should not be overlooked.

Radio—an Information Service

Sir Robert said that his notes could not be accepted with sympathy unless it was agreed that the sole purpose of radio equipment in air transport was to provide an information service, and he went on to compare the radio facilities available to civil aviation in 1939 with those used by typical night bombers of 1944. A direct comparison was less unfair than might superficially be assumed because the accurate placing of an individual passenger in space and in time was more important than the accurate placing of an individual bomb in space and time. The U.K. civil aircraft of 1939 carried an M.F. transmitter-receiver with six spot frequencies for communication by W.T. and, if better equipped than average, an M.F. D/F loop. The largest long-distance aircraft carried additionally H.F. equipment for long-range working.

Position-fixing service was provided by ground D/F stations which, with the associated communication channels, became overloaded at quite low traffic densities. Such radiotelephonic equipment as was appearing gave speech of poor intrinsic intelligibility, and airborne D/F equipment was subject to very grave errors through the reception of ionospherically propagated signals. The application of the Adcock principle to airborne equipment was then, and indeed still remains, an unsolved problem. Equisignal track guides in the medium-distance form (Radio Range) and the shorter-distance form (Lorenz) were in use in the U.S.A. and Europe respectively, but their defects and limitations had prevented their operational introduction in this country.

The heavy night bomber of 1944, operating over the Continent from airfields in this country, carried some 1,300 lb weight of radio equipment, of which the principal items were:—

	lb
G.P. set T.1154/R.1155 (M/F and H/F, W/T and D/F) for long- and medium-distance communications	258
V.H.F. T.R. 1143 (or H/F T.R.1196=35 lb) for local control and inter-aircraft R/T communications	95
A.1134A for intercommunication	28
I.F.F. Mk III (T.3090)	35
A.R.I. 5083 (Gee) for navigation	120
S.B.A.—R.1124C/R.1125A for track guide and approach	75
H2S ..... about	700
	1,311

Supplemented or replaced in some cases by Oboe, Loran, Rebecca, radio-counter-measure equipment, etc.

The planned weight of radio equipment for some civil aircraft now under construction in the U.K. is given for comparison:—

	All-up weight lb	Weight of radio lb	Per cent of all-up weight
Brabazon I	250,000	1,056	0.42
,, II (Ambassador) ..	45,000	665	1.48
,, VA (Marathon) ..	16,450	506	3.08
,, VB (Dove)	8,000	205	2.56
Tudor I	70,000	1,056	1.51
,, II	70,000	973	1.39

Commenting on the "growing array of black boxes" with which the radio man horrified and annoyed, the lecturer said that the modern transport aircraft does not drink less than one gallon of fuel per engine per minute. Aircraft desiring to land at one of the largest and best organized of the world's existing airports (probably la Guardia) must even, on present limited traffic densities, be prepared to be held-up for 75 or more minutes before being permitted to land. For this alone they must carry 150 to 300 gallons of additional fuel—in fact, a typical and highly efficient operator, acutely sensitive about payload, who uses twin-engine aircraft, provides 330 imperial gallons, carried irrespective of weather, for this purpose.

This was one ton of fuel, twice the weight of the generous radio installation proposed to be carried against one only of the contingencies which radio aids can eliminate. Sir Robert also said that there were many better reasons than economy for staying on the planned track of the flight plan, but from the point of view of load, it would be better for an aircraft to carry additional radio for constant use than additional fuel. "A factor of safety was in essence a coefficient of ignorance; radio, as the enemy of ignorance, provided for the safe reduction of factors of safety."

Sir Robert said that it was certain that the weights of radio units could be halved by techniques already in our possession if the development effort was made available and properly applied.

Civil aviation had to fight alike nature and man, and there were four outstanding natural obstacles which fell at the present time into the order: (1) Cumulo-Nimbus cloud; (2) ice formation; (3) poor visibility; (4) winds. The air will not become the normal milieu of the traveller until aircraft can avoid turbulent areas marked by Cu.-Nim. formation which at the best caused acute passenger discomfort and at the worst might completely break up the aircraft—a danger which increases rapidly as the linear dimensions of aircraft increase.

Regularity of schedule would necessarily be sacrificed to safety unless aircraft could avoid areas of severe ice accretion. Poor range of visibility was an adverse condition more frequently experienced than the previous two. It was given a low rating because combined radio and non-radio resources were

RADIO AND CIVIL AVIATION

already available to rob it of most of its old terrors. Adverse winds were daily enemies of punctuality. The man-made obstacles were almost exclusively the product of high traffic densities.

The main object of his notes, said Sir Robert, was to examine the ways in which radio could be applied to overcome these obstacles. The general problem had been stated in the record of the Third Commonwealth and Empire Conference on Radio for Civil Aviation held in London in July-August, 1945. The Conference examined services conveniently classified under the main heads: (1) communication; (2) navigational aids; (3) obstacle marking, collision warning and avoidance; (4) aids to final approach and landing; (5) air-sea rescue operations; (6) aids to traffic control.

Commenting on detail operational requirements, Sir Robert mentioned "the very precious and now effectively inextensible radio-frequency spectrum." The first point arising from shortage of available radio-frequency channels was that no service should be demanded of radio which could be provided otherwise. The generally conceded principle was that mobile services should have prior claim over fixed services; fast-moving long-distance craft over slow-moving short-range craft; and that safety-of-life provision had an over-riding claim. There was room for the further application of the sound principle "don't use radio if you can help it"; as an example the lecturer was strongly of the opinion that completely blind landing by radio means should only be given a high priority if it could be shown that the runway lighting now available was insufficient to give limited but adequate visibility for visual completion of the landing in a very great proportion of all cases.

One of the main determining factors in the selection and development of particular radio aids, and in the choice between radar and non-radar aids to navigation, was the rate of transmission of information permitted by a particular frequency channel. Four major questions presented themselves on every radio aid: (1) does it provide the kind and quantity of information required; (2) does it present it in a convenient form to the user; (3) does it justify the sacrifice in weight, space, drag and power consumption; (4) does it justify the sacrifice in frequency channels which it denies to other users.

The lecturer went on to discuss position-finders, avoidance of Cu.-Nim. and collision, and communications on route. He believed that ground-to-air communication was more important than the reverse. On the subject of positioning devices of the lattice line grid type, he said there was a requirement for notice of failure or recovery of any part of the equipment to be given, also of the influence of outside disturbance caused by absorption or unwanted reflection of radio waves.

Sir Robert stated that much credit was due to two American scientists (G. Breit and M. A. Tuve) for the introduction of the pulse system after Appleton's pioneer ionosphere work. In answer to a question, later, Sir Robert said that Loran, introduced by America, had come out of the common stock of knowledge at a comparatively late date. In conclusion, Sir Robert commented on the excellent military and civil partnership in wartime, and said that the Government and industries must now develop a similar co-operation, and that the Government with the aid of aircraft manufacturers must stimulate the industrial development of laboratories. In a final word, the lecturer asked if designers would provide plastic fins, leading edges, etc., in which could be tucked away some of the radio equipment.

The Discussion

The discussion was opened by Dr. H. Roxbee Cox, who said he was impressed by the case as stated for radio as an economy even though it appeared to reduce payload. Safe flying depended upon the avoidance of certain danger areas (climatic) on the grounds of structural strength, and if structural weight could be saved by the avoidance of danger areas through the use of radio, there was certainly justification for this use. The reliability of the equipment would be all-important. Dr. Roxbee Cox, as a result of the lecture, had a vision of aerial tramlines. He concluded his remarks by asking for information on any difficulties so far experienced with plastic structures of the type referred to.

In reply, Sir Robert said that he preferred the term "ethereal trackless trolleys" as he had a poor opinion of lines as exemplified by Radio Range. He asked leave to take advice on the question regarding plastic structures. As the discussion developed a question was asked with regard to electric de-icing; should plastic leading-edges be adopted? Also on the effect of ice on the equipment contained in them.

The introduction of high-capacity A.C. generating systems for weight saving was also discussed. In answer, Sir Robert said that radio men looked forward to the disappearance of primary D.C. supplies on aircraft, but that other users required it, and that radio was a comparatively small consumer.

The lecturer's assumption of the presence of a pilot was questioned. Under the worst conditions the pilot could be discounted, and future systems must be completely automatic. At the least the weight of one pilot could be saved while the other was retained for emergencies. The lecturer answered that he took an academic interest in automatic landing and held very conservative views. He thought the fully-automatic landing should be entered on the priority list later.

On the subject of "radio space" another speaker illustrated the shortage with a mention of a transatlantic telephone cable now under consideration, and he was glad to see consideration of the value of radio service versus space appropriation. The lecturer agreed with the remarks concerning the overcrowded spectrum and the desirability of removing point-to-point services, but added that different operating groups had conflicting interests.

Group Captain Fennessy commented on the influence of radio on aircraft design. Radio aids were an extension of the pilot's senses. Was it now necessary for the pilot to sit at the front of the aircraft when all information could be displayed to him on meters or cathode-ray tubes elsewhere in the fuselage?

Mr. Vernon said that one aircraft with 27 distinct aerials could be named; he wondered if a switch device for aerials would become available so that one aerial could be used for two or more purposes.

Air Commodore G. P. Chamberlain said that all radio equipment should be capable of operation by someone of no more than average intelligence. He looked forward to the use of radio teletype in place of the morse code, and the elimination of the special operator. He was sorry that no mention was made of the radio altimeter. The barometric altimeter had limitations but was suitable for training when operation was from a single base. Q.F.E. corrections were not good enough for base-to-base-operation. There was room for the radio altimeter to come into its own. In answer Sir Robert said that the radio altimeter should undergo substantial improvements, and that he hoped and thought it would.

The chairman, Sir F. Handley Page, wound up the discussion with some characteristically humorous comments. Among the points he made was the insistence that there must be no increase in drag from equipment, and that there was no need for the radio designer to wait for the aircraft designer to move; he could start from the beginning and offer anything that was not outside the aircraft and produced no drag. He said the operator bought an aircraft to take a certain payload from A to B. For progress in aircraft design everyone concerned (referring specially to ancilliaries) should be allotted so much weight. To achieve high speed, designers brought down structural weight, and then their efforts were spoiled by the addition of equipment. He added that he thought Sir Robert should be strictly rationed and again stressed the need for all aerials to be inside.

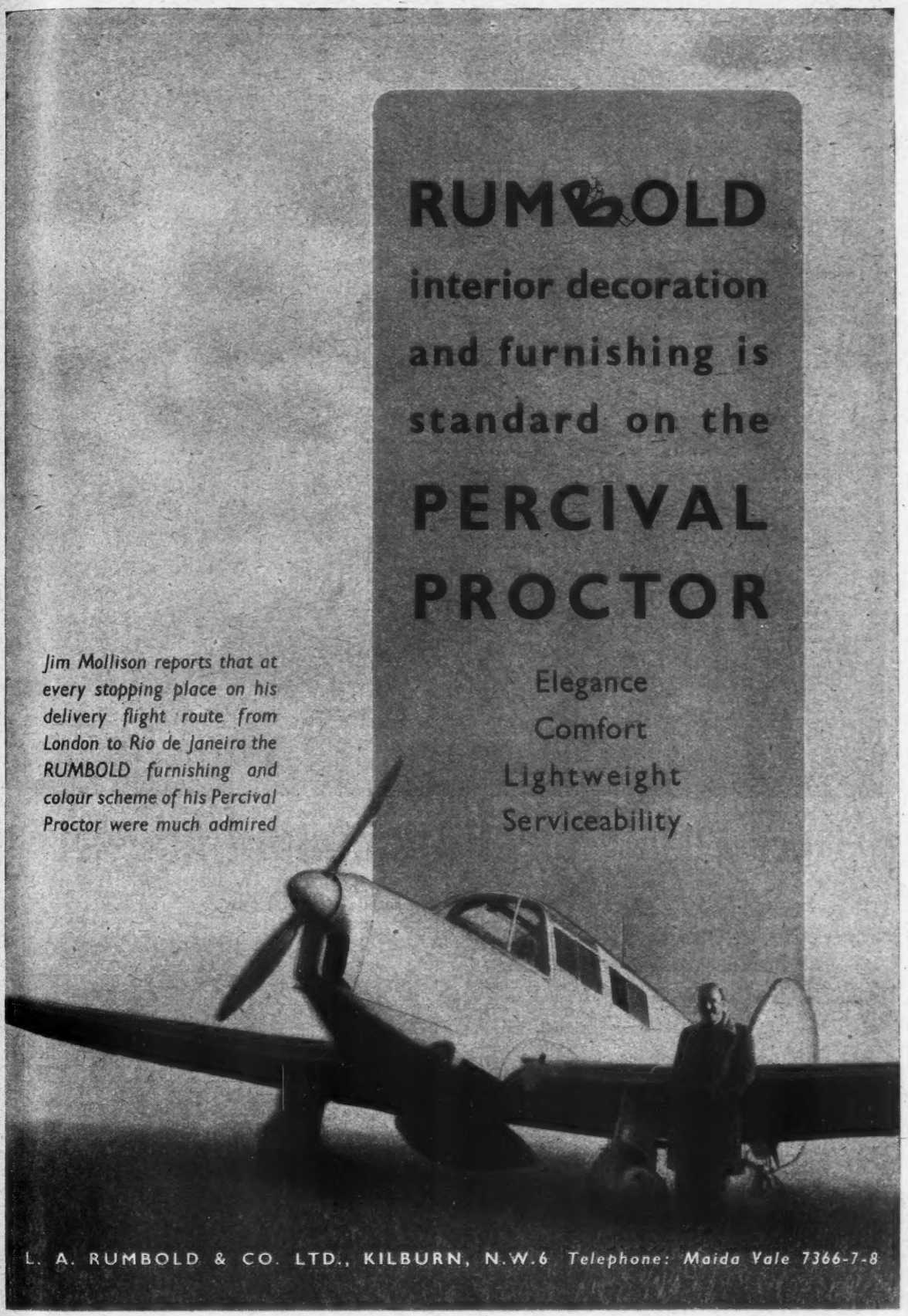
Sir Robert agreed on the rationing of equipment, with the proviso that the relative value of payload received proper consideration.

GERMAN ELECTRONICS AT EARL'S COURT

FROM March 4th to 16th (excluding 10th) British designers and manufacturers can study at Earl's Court the more important German techniques in building and applying radio, radar, infra-red and television. The show is not open to the public. The sponsors (S.I.G.E.S.O. = Sub-Committee for the Investigation of German Electronics and Signals Operation) emphasise that it is no function of the exhibition to solicit orders for German firms, but rather to disseminate the results of official investigations. It is impossible, nevertheless, not to be deeply impressed by many of the items, particularly the infra-red telescopes, thermal receivers and photo-electric receivers. In this connection it is interesting to learn that as long ago as 1940 the Germans were experimenting with airborne devices for observing the hot exhausts of bombers.

The "telemechanics" exhibits include some marvellously delicate devices for controlling A.A. missiles and pilotless aircraft. Besides radio control the Germans evolved a wire control system to avoid jamming which they applied to the X.4, an anti-aircraft rocket projectile to be launched and controlled by an Fw 190. The principle was patented in 1917.

Special sections are devoted to communication equipment; radar (the importance to the Germans of a captured H_2S is made clear); radio navigational aids; acoustics; measurement and test gear; and components.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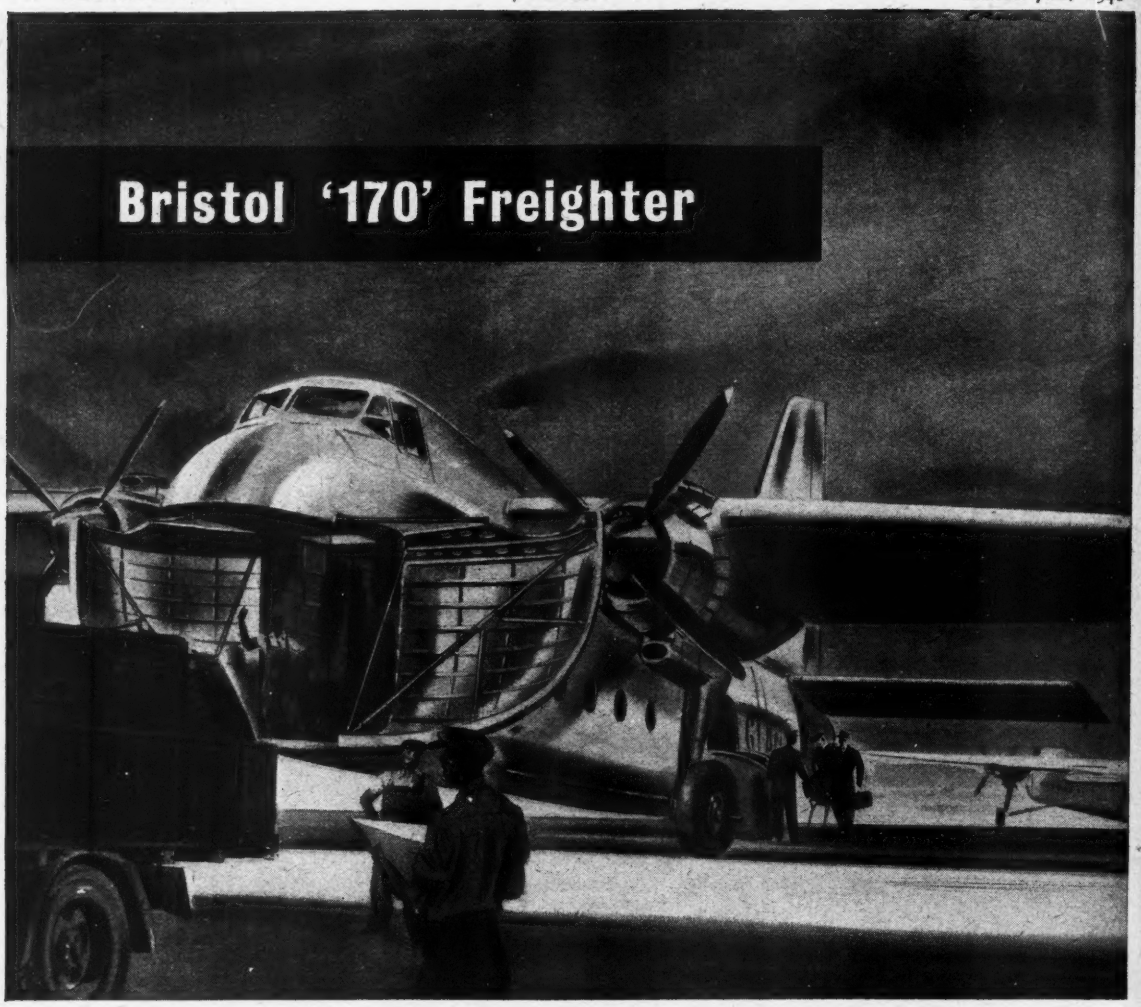

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Tubular members	*NORAL 62ST to Spec. D.T.D. 460 and NORAL 62SW to D.T.D. 450.*
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The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE D.H. GOBLIN II

Net Thrust Calculations

IN a descriptive article on the D.H. Goblin II in *Flight*, Feb. 21st, on page 187, there was a very interesting diagram giving component axial loads on the various engine units under static conditions. Below the diagram the net thrust at the engine mountings is stated to be 3,000 lb.

Out of interest, and not in any Doubting-Thomas spirit, I totalled these loads and made them equal only 2,500 lb. Perhaps my arithmetic is not all it should be . . .

VIVIAN CRISP.

[The reader's arithmetic is probably quite sound, but did he notice that his thrust of 2,500 lb. was also "in reverse." The explanation is that among the total figures is one of −5,500 lb load, *transmitted* by the centre casing. This figure is only indicative of the load carried in this portion of the engine framework. It is labelled "no gas load on this component," and should not be included in the sum of component axial loads. Adding again we get:—(a) +300 +6,800 +800 +600 = +8,500 lb.; (b) −3,100−2,400 = −5,500 lb.; subtracting: 8,500−5,500 = +3,000 lb.—ED.]

AIR MAIL RATES

Why are They So Very High?

CAN someone explain why it costs 5/- to send a 2-ounce air mail letter from London to New York, as compared with 3½d. for the same letter by sea mail?

The above air mail rate works out at about 27/3 per ton mile, which is a ridiculously high figure even for a most inefficiently run airline operating the most uneconomical aircraft. It is, in fact, of the order of ten times the figure which should apply for operation of a good modern aircraft, such as the Tudor or Constellation.

The current passenger fare works out at roughly twice the first class sea passage, and Pan American seem to believe that even these airline fares are higher than need be. Mails need less in the way of amenities during the trip than passengers, and can hardly require higher handling charges either.

If we assume the average airline passenger, with his free baggage, to weigh 200 lb, and take his fare at the present rate of £94, then this corresponds to a charge of only 1/2 per 2 ounce, or 6/5 per ton mile.

"ALL FIRST CLASS MAIL BY AIR."

ON BEING C.G. CONSCIOUS

Loading Errors Can Cause Air Accidents

STUDYING the number of air crashes recently the ordinary person must be bewildered by the lack of conclusive evidence as to their cause. Mystery surrounds quite a number. Psychological factors are vaguely mentioned and many hypotheses are put forward—overworked pilots, disgruntled ground crews, outworn equipment, hasty servicing. Though some of these may be contributory none of them quite solves the problem. There is always something vague about this sort of explanation.

The point is, are there other factors more important and difficult to assess? The answer is yes; there is one factor most difficult of assessment, and it is hard to believe that it is entirely free from blame, namely, incorrect load distribution around the centre of gravity, or even plain overloading.

The difficulty of assessing this factor in finding the cause of a crash lies in the fact that when an aircraft crashes the load is always displaced. If the pilot does not survive, no one has the faintest idea that loading may have been the cause. If the pilot does survive he usually refers to trim and the trim tabs.

When it is a matter of repatriating men quickly there may be some excuse for overloading a very large fuselage. Many an aircraft must have been flown overloaded during the war, but there is little conclusive evidence to prove that this factor is responsible for many crashes. It is such a difficult fact to establish. It may be that when the war ended and men were clamouring to be evacuated, an easy-going attitude was adopted towards the loading of aircraft which may be responsible for some of the crashes recently reported; especially those that have struck high ground or have crashed at take-off.

It will be noticed that large numbers of Dakotas have been involved in recent crashes. This is undoubtedly due to the higher proportion of this type used as Service transports than any other type, but the temptation to overload a fuselage as spacious as a Dakota must be very strong, and the wing loading of a Dakota is not low by any means. Often mere spaciousness is mistaken for unlimited capacity, the density of the freight carried being ignored. A big, spacious fuselage with only two engines is always a danger.

If all freightable volume were of the same density then loading an aircraft would simply be filling up the cargo space, the designer would see to that, but to stress the obvious, one package may be five times heavier than another of the same volume. As wing loading and cargo spaces have increased, loading and c.g. data has become increasingly important until now its importance cannot be over-estimated. Perhaps loading charts could be devised and placed conveniently inside the fuselages as in the Horsa glider.

Probably the abstract terms "moment," "moment arm," "positive and negative moment" used by weight estimators may be responsible for loading and c.g. data not getting the consideration it warrants among ground crews, to whom a moment may mean nothing more than a short but unspecified period of time. In any case it is a very misleading term. Simpler terms could with advantage be devised. Why not call the c.g. datum the balance point and always clearly mark it inside and outside the fuselage and let it, wherever possible, approximate to the centre of the cargo space.

Everyone who has to deal with civilian air freightage should be c.g. conscious. Its importance to air safety cannot be over-estimated. No designer can make a fuselage foolproof. He may do a lot to stabilize the centre of gravity, but he cannot be held responsible for carelessness in loading. His responsibility is the preparation of carefully compiled loading and c.g. data, and if a pilot or person responsible for loading fails to translate this data into practical terms of safety, lives will be jeopardized.

The story of the crash caused by two fat ladies walking aft to the toilet at the same time may be mere fiction, but it contains a word of warning.

JOHN HOWARD.

R.A.F. SLANG

The Pukka Gen at Last?

DURING the war I have read so many explanations of the origin of the eloquent term "gen"—all different and all wrong—that I feel it is about time I informed an uninterested public of the true derivation of the word which is now an indispensable noun in the weird terminology of the R.A.F.

Your recent correspondent "Ex-Halton Boy" (*Flight*, Feb. 21st) has guessed the nearest so far, but it is still wrong. However, he is more or less correct when referring to the time of its birth. I, personally, would put it a little later, *circa* 1929-30. Certainly the word was born at Halton in my time. Well, here it is!

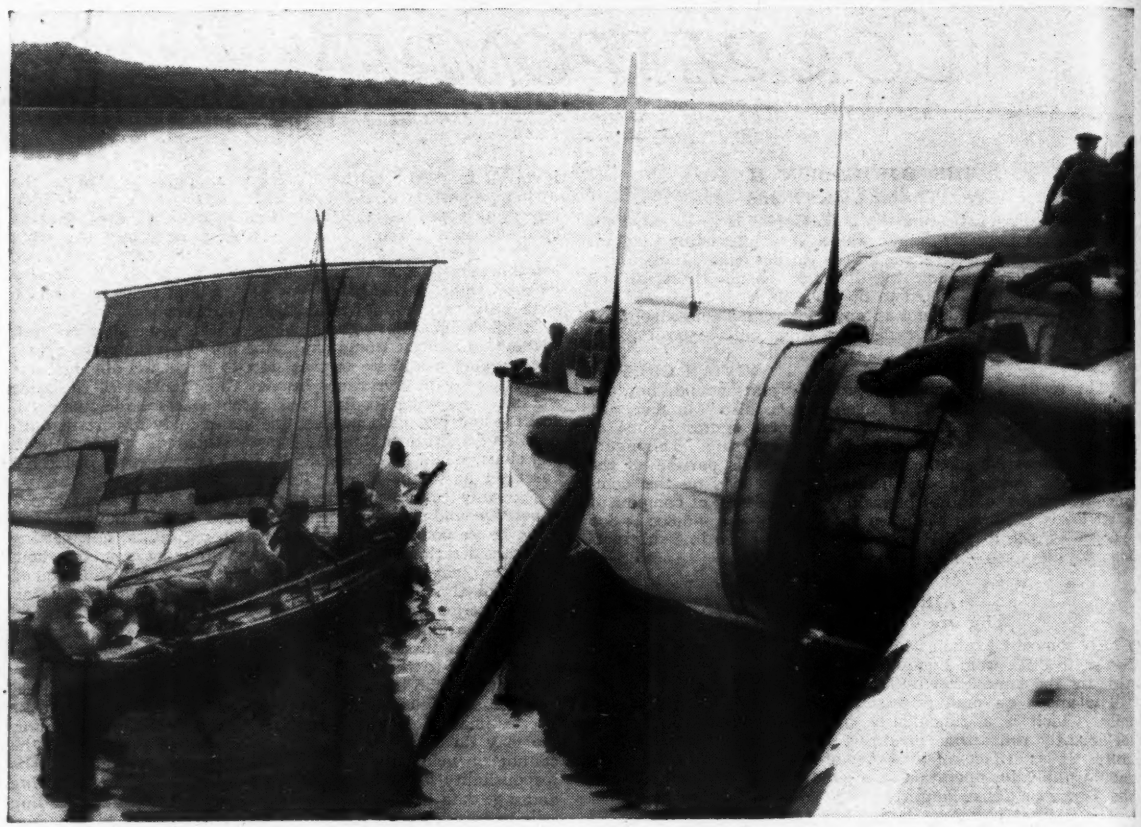
Halton, like other camps everywhere, was always buzzing with rumours, but if an "erk" could conscientiously say, "It's genuine," then one knew that the buzz was true. Then one day, of course, someone said, perhaps accidentally, perhaps purposely, "It's GEN"; and there you are!

For a long period gen, to every Halton boy, stood for the absolute, tried and trusted truth. But, alas, the word left Halton with its devotees as they passed out to men's service, where its stainless character was soon corrupted. No longer could the gen be relied upon. It was suspect, and thus the terms "pukka gen" and "duff gen" arose, signifying positive and negative gen respectively. These additions were no doubt appended by men returned from India, and appeared about 1932.

After the inspiration that produced "gen," it seemed a sad anti-climax, and I myself could never use such blackguardly terms. Perchance this letter may evoke a response from the ex-Haltonite from whose lips this pearl of R.A.F. slang first fell.

May I take this opportunity (as I am getting old and silly and a bit sentimental) of wishing my old Halton friends and enemies the best of luck.

L. W. CRAWFORD.
Lieutenant (A) R.N.V.R.



POWER AND SAIL: An R.A.F. Sunderland and a native sailing boat, pictured on a lake in Borneo, form a pleasant contrast. The Sunderland is making a survey flight over British North Borneo, and the boat is waiting to take off supplies.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

A.T.C. Retirement

AIR MARSHAL SIR LESLIE GOSSAGE, K.C.B., C.V.O., D.S.O., M.C., has resigned his appointment as Chief Commandant and Director-General of the Air Training Corps for private reasons, and his resignation has regretfully been accepted with effect from March 1st.

Sir Leslie Gossage will be succeeded by Air Vice-Marshal Sir Alan Lees, K.C.B., C.B.E., D.S.O., A.F.C., who is directing the arrangements for the proposed re-establishment of auxiliary and reserve forces. This appointment carries a stage further the policy already announced of integrating the A.T.C. with the organisation and administration of the Air Force Reserves.

Air Marshal Sir Leslie Gossage was appointed Chief Commandant and Director-General of the A.T.C. in February, 1944. It was then a new post, created to mark and still further to strengthen the association between the A.T.C. and the R.A.F., as well as to provide the most favourable conditions for post-war development.

He was previously A.O.C. Balloon Command, an appointment he had held since November, 1940, coming to that Command from the Air Council, on which he had been Air Member for Personnel.

For four years, from 1936 until the spring of 1940, he commanded the famous No. 11 Group of Fighter Command and brought it to the keen fighting pitch and excellence of organisation which was so marked when the Group had to bear the brunt of the Battle of Britain. Subsequently, he also held for a time the post of Inspector-General of the R.A.F.

Air Vice-Marshal Sir Alan Lees, who was appointed a K.C.B. in the recent New Year Honours List, has held his present appointment since August, 1945. Formerly, he was in India, first as A.O.C. No. 222 Group from December, 1942, and then, from April, 1944, as Air Officer in Charge of Administration, Air Command, S.E.A.C.

Air Vice-Marshal Lees was appointed Senior Air Staff Officer at H.Q. Bomber Command in September, 1939, and two years later became Air Officer Commanding successively No. 8 Group and No. 2 Group in Bomber Command. Since 1938, he has been mentioned in despatches five times.

Air Vice-Marshal Lees has always been a keen supporter of Service sport, and as such will be particularly welcomed by the A.T.C. He has represented the R.A.F. at cricket, hockey and golf.

Badge of No. 550 Squadron, Royal Air Force — "Per ignem vincimus" (Through fire we conquer).

Badge of Royal Air Force Station, Newton — "Docemus et discimus" (We teach and we learn).

Awards

Naval Air Arm

LT. CDR. (A) ERIC MELROSE BROWN, M.B.E., D.S.C., R.N.V.R., pilot of the Sea Vampire which was the first jet-propelled aircraft to land on a carrier, has been awarded the O.B.E. in recognition of his skill and devotion to duty. When recommending Lt. Cdr. Brown for the decoration, Vice-Admiral Sir Denis W. Boyd, C.B., C.B.E., D.S.C., wrote: "The unknown elements of the first deck landings of a type of aircraft are many. The judgment of distance, and the behaviour of the aircraft cannot be reproduced on land. I consider the pilot runs considerable risk, and could only carry out this type of work by a superb confidence in his skill—a confidence which is shared by all who have seen him fly."

Lt. (A) J. T. PRATT, Deck-Landing Control Officer, receives the M.B.E. The official citations appear below.

O.B.E. (Mil.)

Temp. Act. Lt. Cdr. (A) E. M. BROWN, M.B.E., D.S.C., R.N.V.R.—For courage, exceptional skill and devotion to duty, in carrying out the first deck-landings of Mosquito and Vampire. In doing so he has been the first pilot ever to land on the deck of a carrier a twin-engined aircraft and a pure jet-propelled aircraft. The success of these great strides in Naval aviation has been largely due to his exceptional flying skill.

M.B.E. (Mil.)

Temp. Lt. (A) J. T. PRATT, R.N.V.R.—For great skill and devotion to duty as Deck-Landing Control Officer in the first carrier landing of a jet-propelled Vampire

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SERVICE AVIATION

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Service Order

Act. Flt. Lt. C. N. SANDFORD, R.A.A.F.

Second Bar to Distinguished Flying Cross

Act. Sqn. Ldr. J. BERRY, D.F.C., R.A.F.V.R., No. 501 Sqn.*—Since the award of the D.F.C., this officer has flown on many operational sorties and has destroyed a further 41 flying bombs, bringing his total to 58 bombs destroyed at night. On several occasions his aircraft has been damaged by the explosion of the bombs. As squadron commander, Sqn. Ldr. Berry has displayed courage and devotion to duty of a high order, and under his inspiring leadership the squadron has attained many successes.

Bar to Distinguished Flying Cross

Sqn. Ldr. R. A. BODDINGTON, D.F.C., R.A.F.V.R., No. 635 Sqn.*
Flt. Lt. N. J. GIBBONS, D.F.C., R.C.A.F., No. 418 (R.C.A.F.) Sqn.

Distinguished Flying Cross

Act. Wing Cdr. R. G. PRIER, R.A.F., No. 13 Sqn.
Act. Wing Cdr. V. REES, R.A.F., No. 18 Sqn.
Flt. Lt. D. G. R. WARD, R.A.F.V.R., No. 252 Sqn.
F/O. A. J. HANMORE, R.A.F.V.R., No. 148 Sqn.
F/O. P. A. RANKIN, R.A.F.V.R., No. 13 Sqn.
W/O. E. A. C. BARFOOT, R.A.F.V.R., No. 267 Sqn.
W/O. M. GELBHAUR, R.A.F.V.R., No. 6 Sqn.
W/O. K. G. HOLLIDAY, R.A.F.V.R., No. 117 Sqn.
F/O. W. A. BELSON, R.A.A.F., No. 148 Sqn.
F/O. C. G. THOMAS, R.A.A.F., No. 148 Sqn.
F/O. J. A. GORDON, R.C.A.F., No. 253 Sqn.
F/O. H. C. OLAFSON, R.C.A.F., No. 436 (R.C.A.F.) Sqn.
Maj. H. T. FRYLINCK, S.A.A.F., No. 16 (S.A.A.F.) Sqn.
Capt. D. A. ABERCROMBIE, S.A.A.F., No. 25 (S.A.A.F.) Sqn.
Capt. I. H. CAMPBELL, S.A.A.F., No. 12 (S.A.A.F.) Sqn.
Capt. K. R. CROSSMAN, S.A.A.F., No. 25 (S.A.A.F.) Sqn.
Capt. B. FORSTER, S.A.A.F., No. 21 (S.A.A.F.) Sqn.
Capt. C. F. MARIAS, S.A.A.F., No. 25 (S.A.A.F.) Sqn.
Capt. H. C. MURMAN S.A.A.F., No. 15 (S.A.A.F.) Sqn.
Capt. C. R. SINCLAIR, S.A.A.F., No. 11 (S.A.A.F.) Sqn.
Lt. N. A. STOCKS, S.A.A.F., No.13 Sqn.
F/O. R. T. HOCKING, R.A.A.F.
Group Capt. V. E. HANCOCK, O.B.E., R.A.A.F.
Group Capt. P. A. PARKER, R.A.A.F.
Wing Cdr. R. E. BELL, R.A.A.F.
Wing Cdr. H. A. CONAGHAN, R.A.A.F.
Wing Cdr. O. B. HALL, A.F.C., R.A.A.F.
Wing Cdr. P. J. MCMAHON, R.A.A.F.
Act. Wing Cdr. J. W. KESSEY, R.A.A.F.
Sqn. Ldr. I. O. BLACK, R.A.A.F.
Sqn. Ldr. H. R. BONYTHON, A.F.C., R.A.A.F.
Sqn. Ldr. K. A. CRISP, R.A.A.F.
Sqn. Ldr. K. J. GRAY, R.A.A.F.
Sqn. Ldr. P. B. JONES, R.A.A.F.
Sqn. Ldr. S. J. NICHOL, R.A.A.F.
Sqn. Ldr. B. M. H. PALMER, R.A.A.F.
Sqn. Ldr. G. M. SNOOK, R.A.A.F.
Flt. Lt. W. O. CABLE, R.A.A.F.
Flt. Lt. D. J. CORMACK, R.A.A.F.
Flt. Lt. G. I. COBY, R.A.A.F.
Flt. Lt. R. H. GLASSOP, R.A.A.F.
Flt. Lt. G. L. HILLIER, R.A.A.F.
Flt. Lt. L. H. HOKANSON, R.A.A.F.
Flt. Lt. D. MCKENZIE, R.A.A.F.

* Since deceased.

Flt. Lt. E. MOORE, R.A.A.F.
Flt. Lt. B. ORTLEPP, R.A.A.F.
F/O. A. J. G. POLKINGHORNE, R.A.A.F.
P/O. R. G. MCCLINTOCK, R.A.A.F.
Flt. Lt. D. F. RAYMES, A.F.C., R.C.A.F.
Act. Sqn. Ldr. A. L. CARTER, R.A.F., No. 582 Sqn.*
Flt. Lt. A. G. DEBEER, R.A.F.V.R., No. 582 Sqn.
Flt. Lt. K. H. EAMES, R.A.F.V.R., No. 626 Sqn.*
Flt. Lt. R. T. JOHNS, R.A.F., No. 35 Sqn.
Flt. Lt. A. E. JONES, R.A.F., No. 153 Sqn.*
Act. Flt. Lt. D. BELOT, R.A.F.V.R., No. 12 Sqn.*
Act. Flt. Lt. R. BROOK, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.*
Act. Flt. Lt. H. F. MORRISH, R.A.F.V.R., No. 156 Sqn.*
Act. Flt. Lt. K. USHER, R.A.F.V.R., No. 635 Sqn.*
F/O. T. R. COURT, R.A.F.V.R., No. 138 Sqn.*
F/O. A. E. EASTERBEE, R.A.F.V.R., No. 272 Sqn.*
F/O. A. LINTON, R.A.F.V.R., No. 35 Sqn.*
F/O. P. MCCARTNEY, R.A.F.V.R., No. 404 (R.C.A.F.) Sqn.*
F/O. J. M. SINCLAIR, R.A.F.V.R., No. 166 Sqn.*
P/O. A. J. ADAMS, R.A.F.V.R., No. 166 Sqn.*
P/O. A. ASTLE, R.A.F.V.R., No. 156 Sqn.*
Flt. Lt. O. S. SHAVE, R.A.A.F., No. 357 Sqn.
Flt. Lt. S. D. TITTERINGTON, R.A.A.F., No. 357 Sqn.
Act. Flt. Lt. R. M. CLARKE, R.A.A.F., No. 635 Sqn.
Act. Flt. Lt. F. L. CONN, R.A.A.F., No. 100 Sqn.
Act. Flt. Lt. F. E. MCLEAN, R.A.A.F., No. 83 Sqn.
F/O. R. W. BROWN, R.A.A.F., No. 35 Sqn.
F/O. I. L. FELGATE, R.A.A.F., No. 12 Sqn.
F/O. G. V. WILLIAMS, R.A.A.F., No. 35 Sqn.
P/O. A. D. MORRISON, R.A.A.F., No. 635 Sqn.
P/O. D. R. PATTERSON, R.A.A.F., No. 635 Sqn.
Flt. Lt. P. H. CRONYN, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. C. H. FISHER, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Flt. Lt. E. B. MCCUTCHEON, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Flt. Lt. P. R. J. MAVAUT, R.C.A.F., No. 106 Sqn.
Flt. Lt. D. S. NELSON, R.C.A.F., No. 626 Sqn.
Flt. Lt. W. E. PEARSON, R.C.A.F., No. 97 Sqn.
Act. Flt. Lt. A. T. CLARK, R.C.A.F., No. 57 Sqn.
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F/O. T. R. MURRAY, R.C.A.F., No. 626 Sqn.
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Act. Flt. Lt. G. S. DAVIES, R.N.Z.A.F., No. 75 (R.N.Z.A.F.) Sqn.
Maj. R. L. MORRISON, S.A.A.F., No. 5 (S.A.A.F.) Sqn.
Flt. Lt. J. G. E. EVANS, R.A.A.F., No. 156 Sqn.
Flt Lt. R. K. GIBSON, R.A.A.F., No 609 Sqn.

Distinguished Flying Medal

Flt. Sgt. H. BOTTERILL, R.A.F.V.R., No. 635 Sqn.*
Flt. Sgt. S. C. BURLEIGH, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. C. DAINTITH, R.A.F.V.R., No. 12 Sqn.*
Flt. Sgt. K. N. MONK (now F/O.), R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. G. WILLIAMS, R.A.F.V.R., No. 635 Sqn.*
Sgt. (now P/O.) A. W. MANNING, R.A.F.V.R., No. 249 Sqn.
Sgt. A. SUTCLIFFE, R.A.F.V.R., No. 158 Sqn.*
Flt. Sgt. H. R. LONGWORTH, R.A.A.F.

THE KING has been graciously pleased to approve the following awards:—

O.B.E. (Mil)

Act. Sqn. Ldr. J. F. AFFLECK, R.A.F.V.R., R.A.F. Station, Burnham.

Air Force Cross

Sqn. Ldr. G. F. KIMBALL, R.C.A.F.
Sqn. Ldr. D. F. RITZEL, R.C.A.F.
Sqn. Ldr. P. WILKINSON, R.C.A.F.
Flt. Lt. J. E. BURROWS, R.C.A.F.
Flt. Lt. L. E. BURROWS, R.C.A.F.
Flt. Lt. H. A. GARDNER, R.C.A.F.
F/O. J. J. ASHER, R.C.A.F.
W/O. F. H. W. DEALEY, R.C.A.F.
Wing Cdr. D. J. BROOKER, R.C.A.F.
Sqn. Ldr. E. R. JOHNSTON, R.C.A.F.
Sqn. Ldr. C. W. STOCKFORD, R.C.A.F.
Flt. Lt. P. C. BARRON, R.C.A.F.
Flt. Lt. T. C. COOKE, D.F.C., R.C.A.F.
Flt. Lt. J. F. SIMPSON, R.C.A.F.
Sqn. Ldr. A. A. D. PENTLAND, M.C., D.F.C.

George Medal

Wing Cdr. T. E. H. GROVE, D.S.C., R.A.F.V.R. R.A.F. Station, Burnham.
F/O. J. J. BAILLIE, R.C.A.F., No. 194 Sqn.
Cpl. S. J. COGGER, R.A.F.V.R., R.A.F. Station, Woodhall Spa.

B.E.M. (Mil.)

Flt. Sgt. D. A. EVANS, R.A.F.V.R., R.A.F. Station, Burnham.
Flt. Sgt. R. J. HODGES, R.A.F.V.R., R.A.F. Station, Burnham.
Sgt. L. W. G. COATES, R.A.F.V.R., R.A.F. Station, Burnham.
Flt. Sgt. G. W. SIDDONS, R.A.F.V.R., R.A.F. Station, Metheringham.
L. A/C. C. F. HARBOUR, R.A.F.V.R., No. 132 Operational Training Unit.
L. A/C. J. O. WESTON, R.A.F.V.R.

THE KING has been graciously pleased on the advice of His Majesty's Australian Ministers, to approve the following awards:—

O.B.E. (Mil.)

Hon. Wing Cdr. C. P. HARDACRE, R.A.A.F.
Act. Wing Cdr. S. P. HIGGIN, R.A.A.F.

M.B.E. (Mil.)

Sqn. Ldr. C. W. WEARNE, R.A.A.F.
Act. Sqn. Ldr. W. BELL, R.A.A.F.
Flt. Lt. C. L. MCDONALD, R.A.A.F.
Flt. Lt. R. A. ROBINSON, R.A.A.F.
Flt. Lt. R. TAYLOR, R.A.A.F.

George Medal

L.A/C. S. M. RAWLINSON, R.A.A.F.

B.E.M. (Mil.)

Flt. Sgt. A. J. G. JELLEY, R.A.A.F.
L.A/C. M. JEFFERIES, R.A.A.F.

THE KING has been graciously pleased, on the advice of His Majesty's Canadian Ministers, to give orders for the following awards:—

O.B.E. (Mil.)

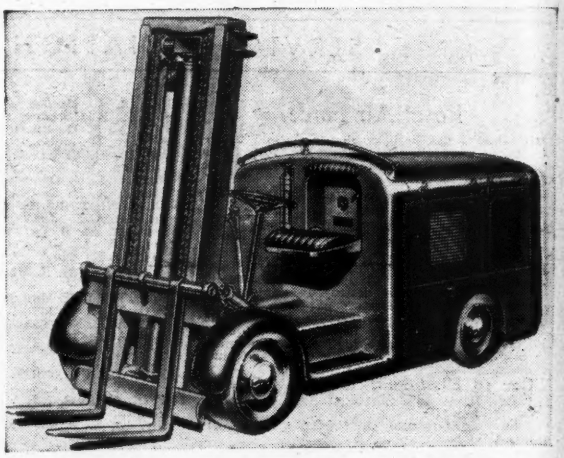
Wing Cdr. L. J. BIRCHALL, D.F.C., R.C.A.F.
Wing Cdr. H. B. LONG, R.C.A.F.

Aboard H.M.S *Ocean* are Lt. Cdr. E. M. Brown, climbing into the Sea Vampire, and (right) Lt. J. T. Pratt. Both have been decorated for their part in the carrier trials of the Sea Vampire last December.

THE INDUSTRY

MESSIER "CONVEYANCER"

New British Lifting Truck for Stores and Aircraft Loading



The new lifting truck which is capable of handling 2-ton loads up to a height of 9ft.

A BRITISH fork lifting truck, "The Conveyancer," will shortly be announced by Messier Aircraft Equipment, Ltd.

Throughout the war Messiers have been solely engaged in the design, development and manufacture of aircraft landing gear and hydraulic equipment, their main activity being the production of undercarriages, tail wheels and complete hydraulic equipment for the "Halifax" heavy bomber. Specialised hydraulic equipment for other military aircraft has also been turned out in large quantities.

The "Conveyancer" in its standard form, or with the addition of special attachments, is capable of handling all kinds of raw materials and finished products for all sections of industry. It can be widely used in stores and warehouses and provides a most speedy means of handling goods with a minimum of man power. Particularly it is suitable for the loading of aircraft, being capable of transferring loads from lorries or stores over any distance and actually depositing the goods inside the fuselage.

Several models of the "Conveyancer," of various powers and sizes, will soon be available, but the one at present in production is capable of picking up, lifting and depositing loads up to 2 tons in weight from floor level to a height of 9ft. Its road speed, by petrol-electric drive, is up to 10 miles per hour both forward and in reverse. The rate of lift, which is fully hydraulic, is approximately 35ft per minute. The telescopic elevator has hydraulic tilting, giving 2½ deg. forward tilt and 10 deg. backward tilt. The width of the vehicle is 4ft and the overall length, from the heel of the fork, is 7ft 3in. The truck has a steering lock of 60deg. either way.

Various attachments can be supplied for the handling of widely differing products.

A smaller model is in course of development and this will be capable of lifting 20cwt.

BACK FROM AMERICA

MR. SHACKLETON arrived back in this country on Thursday last after a four-month tour of the aircraft industries of Canada and the United States. In Canada he visited the Noorduyn, Canadair, Canadian Car and Foundry and de Havilland works, and in the States made a very complete tour of the aircraft, engine and various other factories

The original Fairey hangars at Heathrow are being engulfed by the civil airport. There is much credit due to Faireys for seeing in this area the ideal site for an airfield.

ALAN TURNER OPERA COMPANY

THE Alan Turner Opera Company, which is associated with the Welfare Organization of the Ernest Turner Group of companies, has taken the Grand Theatre, Derby, for the week commencing March 25th, for their first post-war production, the Johann Strauss Musical Comedy, "1,001 Nights." Seventy members of the staffs of the Ernest Turner Group are included in a cast of one hundred headed by professional players.

Derby hospitals are expected to benefit considerably by the week's run.

MEDIUM SIZE RADIAL

CONTINENTAL MOTOR CORP. has begun production of a new nine-cylinder air-cooled radial engine. The direct drive type has a take-off power of 525 h.p. and the geared model 600 h.p. The new engine is a modification of the 450 h.p. R.-975 engine which was built in quantity during the war for medium tanks.

MILES TECHNICAL DIRECTOR

ALEX HENSHAW, holder of the England-to-the-Cape-and-back record, and regarded as one of the finest test pilots in the world, has joined the board of Miles Aircraft of South Africa (Pty.) Ltd., in the capacity of technical director. He will leave this country by air for South Africa shortly, flying a Miles Messenger, which he will demonstrate en route.

Alex Henshaw in his King's Cup days.

Alex Henshaw first flew in 1932, and in 1933 commenced air racing as a hobby, winning the Siddeley trophy in the King's Cup Race of that year. In 1938 he won the King's cup trophy, breaking the record which still stands in his name. In 1939 came his record-breaking flight from London to Cape Town and back which smashed all existing multi-crew and solo records. Although the multi-crew record has since been broken from England to Cape Town by the Lancaster "Aries," Mr. Henshaw's solo flight stands unbeaten.

In 1939 he was awarded the Britannia trophy for the best performance of the year in aviation. At the outbreak of the war he joined Vickers Armstrongs, Ltd., as a test pilot, and in 1940 was appointed chief test pilot at Castle Bromwich. He was awarded the M.B.E. in 1944.

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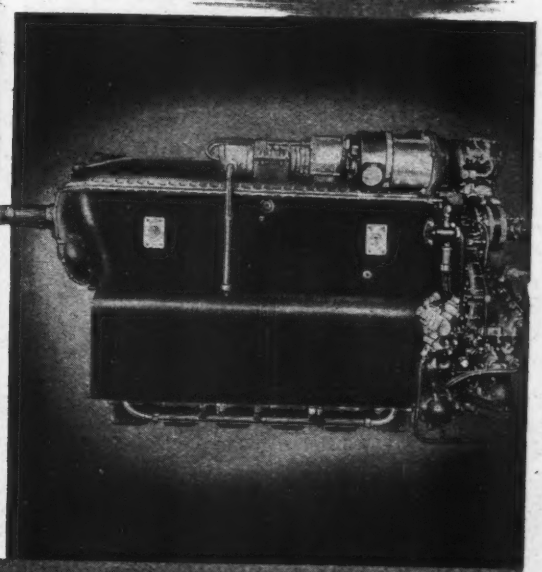

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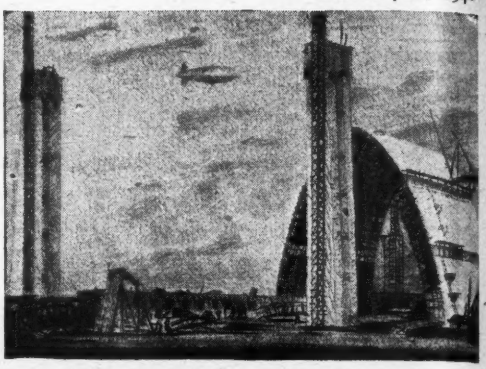

NAVY L.T.A. HANGAR U.S.A.

This hangar, for housing lighter-than-air craft for the U.S. Navy, is illustrated in one of a series of ten graphite pencil drawings by R. Myerscough-Walker. The drawings will be of interest to everyone interested in the techniques of pencil draughtsmanship at its best, and these hangars are of particular interest because they represent timber construction on a scale never before attempted. The shell of the building is 1,000 feet long, 170 feet high at the crown, and has an overall width of 298 feet at ground level. Lithographic reproductions of the drawings, together with the Artist's description of the techniques employed, are available at 2/6 the set, post free.

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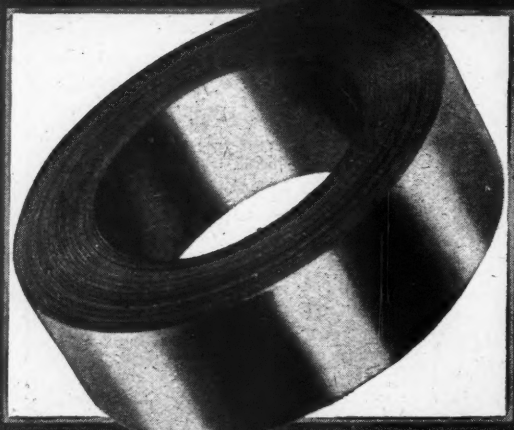

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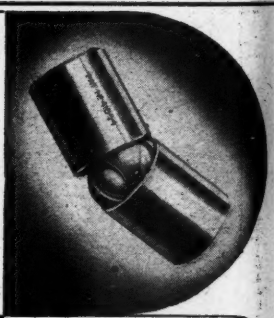

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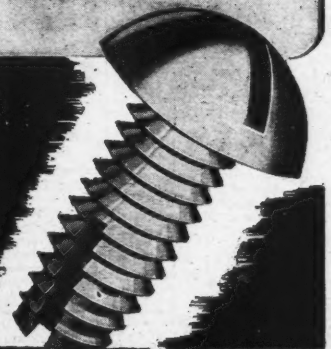

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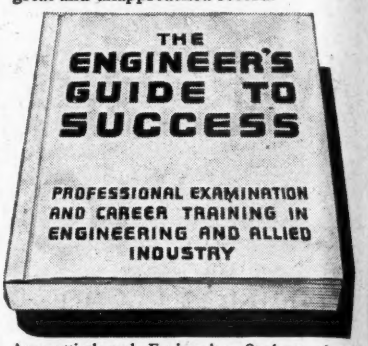

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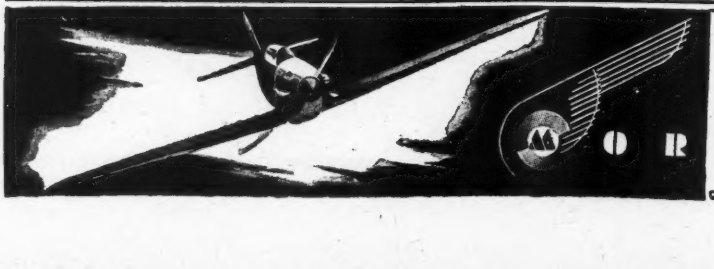

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APPLICATIONS are invited from Air Force personnel with good engineering degrees to train as aircraft stressmen.—Apply to Chief Draughtsman, Aircraft Division, English Electric Co., Ltd., Corporation St., Preston. [6535

LOFTING draughtsmen required with previous experience of full scale layout work.—Write, stating qualifications, experience and salary required, to the Aircraft Staff Officer, Bristol Aeroplane Co., Ltd., Filton, Bristol. [6561

COMMERCIAL pilot, now in R.C.A.F., is anxious to meet others interested in floating small company on a co-op. shares basis, in Northern Canada, trappers, traders, fitters, pilots; state experiences.—Box 6315, c/o *Flight*. [6641

DRAUGHTSMEN wanted for civil aircraft project, must be fully qualified, with two or three years' aircraft experience.—Apply in writing, giving full particulars of qualifications, experience, age, and salary required, to Box 5853, c/o *Flight*. [6552

PLANNING engineers required by Midland engineering company manufacturing light automobile and aircraft units; only applicants first class experience considered; good conditions, salary; give particulars experience, qualifications.—Box 6079. [6596

SENIOR and junior design draughtsmen required for work on new type of civil aircraft, aeronautical experience essential; good salaries and prospects.—Apply to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0241

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EXPERIENCED senior draughtsmen and stressmen wanted; also weight estimators and research technicians.—Apply, giving full particulars of qualifications, experience, age and salary required, Labour Manager, Vickers-Armstrongs, Ltd., Weybridge. [6645

SENIOR designer draughtsmen possessing technical qualifications and necessary general engineering experience required by important Midland engineering company manufacturing automobile units; write, giving particulars, age, experience, salary.—Box 6078. [6595

TECHNICAL artist required for aircraft handbook illustrations, good style, sound knowledge of perspective and previous experience in similar work essential.—Write, stating qualifications, salary required, to the Aircraft Staff Officer, Bristol Aeroplane Co., Ltd., Filton, Bristol. [6560

WANTED, fully experienced junior and senior aircraft draughtsmen and stressmen, good opportunities for men of ability and initiative.—Apply, giving particulars of experience and salary required, to Chief Draughtsman, The English Electric Co., Ltd., Corporation St., Preston. [6536

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EX-R.A.F. engineer officer, age 31, on Class A release, seeks position in civil aviation, ex-aircraft apprentice, 16 years' service, all types engines and airframes.—Box 6291, c/o *Flight*. [6639

EX-R.A.F. Sgt., fitter airframe, age 27, 9 years' experience repair, maintenance, all types, seeks suitable situation in civil aviation or with engineering firm.—Box 6346, c/o *Flight*. [6657

R.A.F., 5 years Officer Commanding M.T. repair units, due for release April, age 39, desires post as maintenance engineer or similar administrative capacity.—Box 6194, c/o *Flight*. [6623

SGT. F. IIE., available May, 6 years R.A.F. comprehensive experience Hercules and Merlin installations, studying for C licence, desires position in civil aviation.—Box 6313, c/o *Flight*. [6643

OVERSEAS.—Aero, mech. and marine engineer, extra chief cert., unique experience, used to handle foreign contracts, own secretary, University educ., linguist, seeking position abroad.—Box 6289.

EXECUTIVE, 31, desires change, wide experience of production control methods in aircraft industry (planning, progress, material control, plant load, stores, records, etc.); West Country preferred.—Box 6286, c/o *Flight*. [6634

PHOTOGRAPHIC N.C.O., just released, R.A.F., seeks progressive post, experienced in mass production (not machine), processing, printing, enlarging and general photography, sound knowledge of air cameras, etc.; previous experience in commercial art. —Box 6344, c/o *Flight*. [6655

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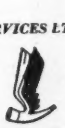

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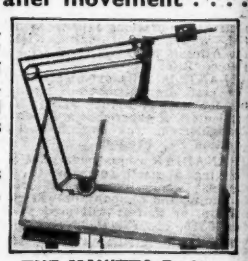

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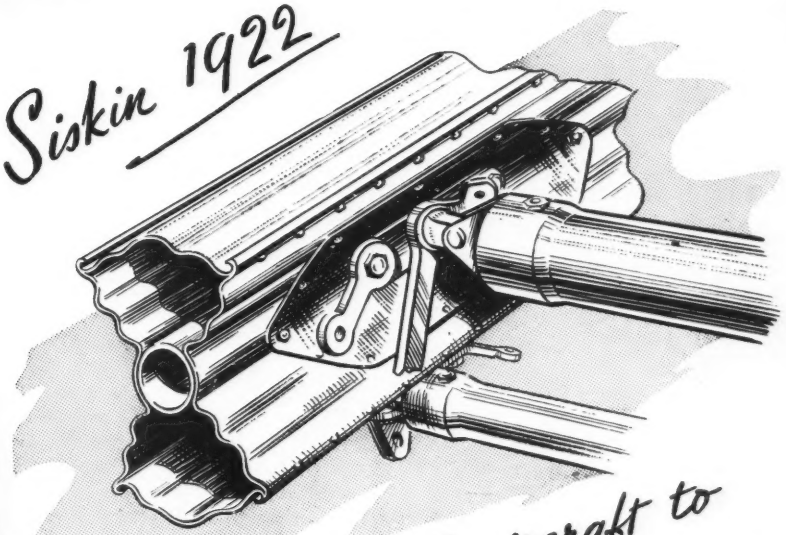

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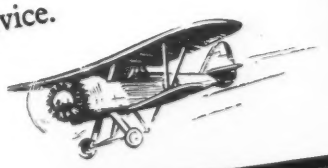

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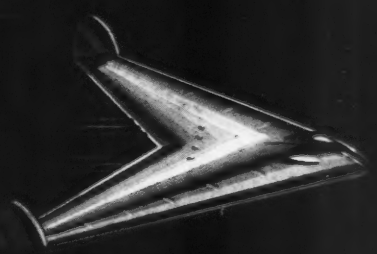

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